Good,

Dmk

—

~~Glad to the House.~~

1881-1-13;
1881-1-27

Good
&
Dink,

[Colored Institute, 1.13.81.,
& 1.27.81.]
Air in the House.

[Col. Institute, 3.23.81]

Food and Drink.

Why do we all eat & drink so often & so much? Not only because we like to, but we must, or we will die. — Dr. Tanner's 40 days - just lived.

Because we waste; as the fire does, or the tree; — they must be fed.

~~Locomotive~~ engine.

Made, & runs — (& repaired) we grow; are made in growing. Also, we get up heat and power & go; fuel.

1. Stuff to build & repair our bodies,

& 2. to run them; i.e. to get up force.

Made of Charcoal, lime, water & air! — we are

C, H, O, N, S, P, Fe, Na, K, Ca, Cl, Fl, Si. these

In what shape? Not pure & simple

Combined — plant or part of animal, except water & salt.

3 sorts of foods; 1. Meat, & pasty part of flour;

2. Fat, Cream, Butter, — 3. Starch & sugar, —

Examples: for making & repairing:

Albumen — Spec — Sugar — Spec.

Fat for running force: energy:

Specimens: white of eg — glucose — bloomer — gum

Properties: — of albumen — Show coag. & Ca

Stand changes — Sugar — Heat NOS — arrangement all stored

Sem — Show coag. weak acids — that ferments. — coagr.

How appropriated & digested & made up into our bodies?

Diagrams

Muscular flesh — fats

Meat? or only vegetables?

Both, for most people in town

at least — Teeth & Stomach — Experiment (bite & on the ways, while)

Questions:

Eat, How often; —

How much; —

What; — &

How, to eat.

About 3 times a day. (not necessary so)

If hungry or empty, a little between; or ↑ up all night, always something then.

Sick, oftener, stronger & less at once. Starving, only strong people at beginning of illness.

How much?

2½ pounds daily — 2/3 vegetable (at least) & 2½ or 3 pints water (with or without tea bef in it).

3/4 pound meat, 1½ pound bread, 1/4 pound butter.

Infant under 6 mos 2½ to 3½ pints milk daily

Birds — young robin 1½ to 2 ounces. Pig in its food bucket —

a man at least, 12 oz solid food daily

Cowards — & in Arctic travel, 20 oz daily.

Dr Tanner

Hardest, in very cold regions; — Esquimaux — 10 to 20 pounds fat meat. Much fuel inside there.

Stop when hunger is sated.

Most people eat too much. Can put in meals ahead. Should never feel our stomachs at all.

Eat slowly, & cheerfully; & rest after dinner awhile.

Saliva — gastric juice — bile & pancreatic juice — Show Diagrams

Eat What? Many things will do.

Example of Perfect food, Milk.

Will do for any length of time, tho' not strongest of food stuffs.

3 parts all in it { Casein, Cream, Sugar of Milk;

also, "salts" needed for our blood

No one sort alone will do long.

Dr. Hammond tried it.

Milk must be pure:

We can test it — Cream — Spec. gravity — taste, smell, — appearance; — (shew) — & fresh; especially for babes in summer { Goats milk; — Cows; — asses; — mares; — Buffaloes. —

in completeness as food,

Flesh — meat with fat on it — & bread with butter. Some fat but not much for most people used all over the world.

Eggs — nutritious & digestible — Protoplasmic.

Beef; — mutton; — chicken, turkey, duck, & goose; — veal; pork { never raw — trichina;

fish; — Oysters, — clams —

Vegetable foods:—

Strongest & completest, Wheat bread (not too white)

rye — oats — Ind. corn — rice.

Peas & beans. (More nitrogen than wheat)

Bolsworst or pea-sausage (peas & bacon fat) in Fr. War

Potatoes — Not very strong diet, but cheap & convenient.

Tomato a fruit; wholesome, Potato, Turkey, Cocoa, Coffee, vanilla, quinine

~~Tomato & pineapple~~ American

Fruits (fresh) wholesome as a rule. Even in cholera time; but never ~~unripe~~ or decayed. Sometimes raw, at times:

watermelon, Cantaloupe, Cranberries, pine apple

celery, lettuce, radishes — fruit. —

[Scurvy — in armies & expeditions.]

Peaches, apples & oranges most wholesome, cherries & pineapples least so.

Variety important — from day to day; not many things same day.

Have bread light & well baked —

Theory of raising, CO_2 & baking bread.

Cakes & preserves & candies not wholesome; — too much eaten.

2nd Lecture.

Drinks.

Water !!!! Pure! ← Alcohol.

Tea, Coffee, Cocoa, Labrador, Abyssinia, Paraguay, &c.

Millions drink of these: Why?

Not always wisely taken; & so, often injurious.

all stimulants (except Cocoa) are whips or spurs — when necessary, they taste force — Don't use them when young & strong; & then they will do you the most good when you do need them.

Over Seasoning, so, in regard to the way, this is

with pepper, mustard & spices.

[Not so with salt & vinegar in the usually taken]

Tea best of the beverages, for health.

Coffee for emergencies —

Cocoa at any time —

[Composition of Tea, Coffee, & Cocoa

Tea: tannic acid & theine or caffeine, theobromine — Coffee: oils, &c — Cocoa: fat —]

Chances of Living.

	Temperate	Intemperate
At 20	= 44.2 years.	15.6 yrs
30	36.5	13.8
40	28.8	11.6
50	21.25	10.8
60	14.285	8.9

[Difference in strength between beers 5 to 10 pct. Wines 5-6 p.ct. & distilled spirits 50 p.ct. The last much the most commonly mischievous.]

Latin, $80; French and German, each, $25; Drawing, $25. Those (either boarding or day scholars) who take both French and German, or one Modern Language with Drawing, will be charged $40 for the two branches. Drawing, French, and German *together*, $50. Payment in advance; one-half in 9th mo., 1878, and the remainder in 2d mo., 1879.

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Physical culture will receive constant attention; the aims of the School being *health, development, character,* and *culture.*

Address,

DR. H. HARTSHORNE,

GERMANTOWN, PHILADA.

Alcohol: ~~whisky~~, wine, ale, &c. ~~that which makes the strength of~~ the heart of man. "Wine that maketh glad ~~the face~~ man" throughout man's folly & weakness it has formed a Mocker & thou-sands. — A quick & pleasing ~~stimulant~~ & destroyer "spur" to heart & brain, but, in any but the smallest amounts disturbing. It blinds the strong man & spoils his goods. It poisons: in-toxication is poisoning. It maddens, as no other poison does (unless hash-eesh, "running a-muck.")

No one needs alcoholic drink in health — Every one ~~has~~ pays better health without it — Excess leads to hankering & dependence upon it — At last, a slavery, almost hopeless escape.

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The danger increases with frequency & amount of indulgence; especially with the young.

[In illness, I believe, sometimes very useful & important as a medicine; — the requires as much care on the part of the physician as any other powerful medicine] Don't risk this danger when you are in health. Easy to abstain before getting into the habit; — it may become impossible afterwards. {See Table of Statistics}

Alcohol i.e. whisky, brandy, wine, beer, does not strengthen, in health, it weakens. Don't keep warm, it lowers temperature. Wears out the heart, Poisons liver, kidneys, brain.

Dismissed

May cause "horrors", well so named, & early death; or, tormenting gout — & also slow killing disease of liver, kidneys, &c; slow & certain poisoning. It damages the machine, ~~or read fully.~~

Avoid it! Begin life determined that whatever you do, you will not throw away your lives upon liquor — you will always be temperate; & no one is entirely sure of that who is not totally abstinent.

Drink milk every day, as best of all, if you like it & can get it pure and fresh. Drink cocoa whenever you please. Drink one cup of tea morning & every when you come to be twenty or twenty five

and work hard every day. years old. Drink a cup or two a cup of coffee when you are very tired, or have to sit up all night long. But never drink whis-key, or even wine or beer, un-less a skilful and careful Doctor recommends it as very important for your health; at the time and then only exactly as much and as long as he prescribes it for you. Then only are you safe, from the most terrible misfortunes that the men are liable to in this world, namely incurable intemperance. Then you may have a clear brain, good digestion, strength for work, and may enjoy life and be useful; "heart within & God overhead".

Exercise.

How are people made strong?

By constitution.

By care of general health.

By exercise:
in proportion to strength, &
with enough rest.

Sick people, & "invalids" can take
(some, ill, none) very little, passive exercise.

Well people can increase
muscular strength greatly:
by moderate efforts, short times, often.

Dr Winship — Rowing —
Walking. Games? — in
Running? moderation
Skating
Bicycling
Swimming?

Work, in proportion, increases strength,
Out of proportion, too hard or too much,
wastes it.

Children should never have hard work.

But young people ought to cultivate
strength for use when they come to
need it for work.

Everyday several times,
Good to have light calisthenics
or a gymnasium in every School, required
Especially the slender, pale, shy
girls & boys need it, in proportion.
Dumbbells — or light chairs over,
for arms, — & walking for legs —
Something, somehow, to keep up entire of muscles.

Exercise is important for general health.—

Circulation, breathing, perspiration —

(Muscles press arteries & veins — Lion's foreleg artery — valves of veins — all towards the heart)

Should be in fresh air — & best when enjoyed —

If work, have a purpose with the work, to do your best in it — But not so as to be overstrained.

Overwork kills People

who want to make more money than there is time for in our days of 24 hours often kill themselves, for want of rest —

Sleep — 12 - 10 - 9 - 8 — 7? 8 - 9 - 10

hours, according to age & strength —

Keep the axe sharp —

(Exercise is of brain as well as of muscles)

Rest one day in seven.

the sabbath was made for man, and man ought thankfully to use it.

Air

In Relation To

Health

Colonial Institute

1881.

1881

Art

In the House

Colored Institute

1881.

Air In the House.

You often hear people talk of ventilation.

Why do we need ventilation?

Best answers, by first answering the Qu. — why do we need to breathe?

Because we are, as I said 2 weeks ago, — so much like locomotive engines; — the slow furnace burning in our blood, whose heat & power keep us going, needs not only fuel but draught.

Breathing gives the draught.

Let me show you a few simple things, — which those of you who are studying or have studied physiology may know already.

1. Make CO_2 from soda bicarb. & ~~Sulphuric~~ acid;

Put lighted taper into it, — again & again: it goes out.

2. Burn lighted match between fingers, & put cap over it: out.

3. Breathe into lime water.

4. Breathe thro tube into glass vessel — & then lower lighted candle into it: out, repeatedly.

5. Show burning candles in glass house, with roof in

a. with closed chimney.

b. open chimney.

c. ditto, & roof partly lifted.

CO_2, then, is a poison.

But that is not all.

Other poison is in breath.

Odor of breath.

Odor of very close room.

Odor of bed long slept in.

No poison kills at once in very small dose. Large dose of this is killing.

Also, slowly promotes & ~~tends towards~~ death, helping other causes to kill.

Scarlet fever,
Diphtheria,
measles,
hooping cough,
Small pox (where not vaccinated)
typhus & typhoid fever,

Kills Consumption & other diseases of the lungs, — most & destroy most lives, in close houses with unwholesome air.

Composition of air —
O, N, HO_2, CO_2, —
Sta, Dust, Organic vapor, &
"germs".

A man or woman, in a day & night, spoils by breathing 350 cub. ft. of air (about 1 gallon a minute); yet don't get all in his room. Should be, if possible, at least 1000 cub. ft. room space for each person, day & night; — and air must move & change.

Not rapidly, with drafts, but steady & gently.

2 ways in nature, out of doors: diffusion, & winds.

How are winds caused?

By differences in heat, & (because heat expands) lightness of diff portions of the air.
Sun on mountain sides — stove —
Upward currents = balloon &c.

Now, in-doors we can use the same forces.

Diffusion goes on all the time of itself — odor — musk or creosote or smoke — tuberose!

High Ceilings.

Diff in heat made by fires.
Inlets & outlets — provide enough

Keep warm, by sufficient fires in cold weather, — by clothing, & active exercise, especially out of doors.

Get (carefully) used to moderate cold. But never expect to be hardened by wearing too little clothing & allowing yourself to feel & suffer from the cold, when you can help it.

In a sleeping room small cracks (as many as you can) in windows, & open doors, will do in cold weather. Open all in warm weather.

In moderately cold weather, or in a room with a fire, — pin or tack up a shawl, or a piece of muslin or flannel, against lower small part third of a window, then open the window a little from the bottom. Air will then come in without draught.

Don't allow any unwholesome thing or place (and bad smelling things are, as a rule, always unwholesome) to taint the air near your homes if you can possibly help it.

Some people are so unwise as to throw potato skins or even bad potatoes, — fish heads, all sorts of spoiled & spoiling things in heaps around, — outside of the house, or even in cellars! Burn them if not carried away. Destructive of health! If cholera should come again, these are the people most liable to be its victims.

Use air, pure air, pure water, enough, not too much, good wholesome food, well cooked, — exercise, — enough sleep, — a good conscience, — will maintain all the health a kind Providence means for us to have, until

his appointed time for our departure.

Have ready: Limewater,
Hydrochloric ~~Sulph.~~ acid vial, beaker.
Sodium, — glass  , stirrer,
& tube; ——— & slop-bucket —
Candle-stick & candle;
Taper, & matches;
Glass house, & small candle-
sticks & candles.

Contents Of

The Atmosphere.

Nearly Constant,

Oxygen 20.8 to 20.61

Nitrogen 79.2 " 77.95.

Variable,

Carbonic Acid, Ozone, Vapor.

Non-essential,

Ammonia, Sulph. hydrogen

Other Inorganic Gases

Mineral Particles

Organic Vapors

Organic Forms.

[1881 ?]

Marmth

Manuscript

Warmth

Heat-motion.

Natural Bodily

Warmth -

~~[illegible]~~

Why needed?

For 1. fluidity - & mobility of protoplasm

2. Chem. changes.

3. Supplement of

Solids —

4. Transmuta. into other forms

of energy:

a. vital -

b. motor -

c. cerebro-N.

High temperature } to much air } to

Muscl. activity } of Brain

Blood Heat of (See other paper)

Birds, ~~Mammals~~, Man,

~~Fishes~~ Worms — (Some plants:

always oxidation where grow)

Table — Man in Disease

Food for warmth -

(mentioned in last lecture

review facts -

Exercise —

Additional Sources —

Sun — great source

of all energy — (Even

in Coal ~~Underground~~

Stored-up sunshine —

Sunlight is wholesome.

Light as well as heat.

(Of course may be excess)

Direct heat & radiant heat.

Clothing.

Needed only in cool climates (except for decorum -

Only protects, by non-conduction.

[Experiments showing this.]

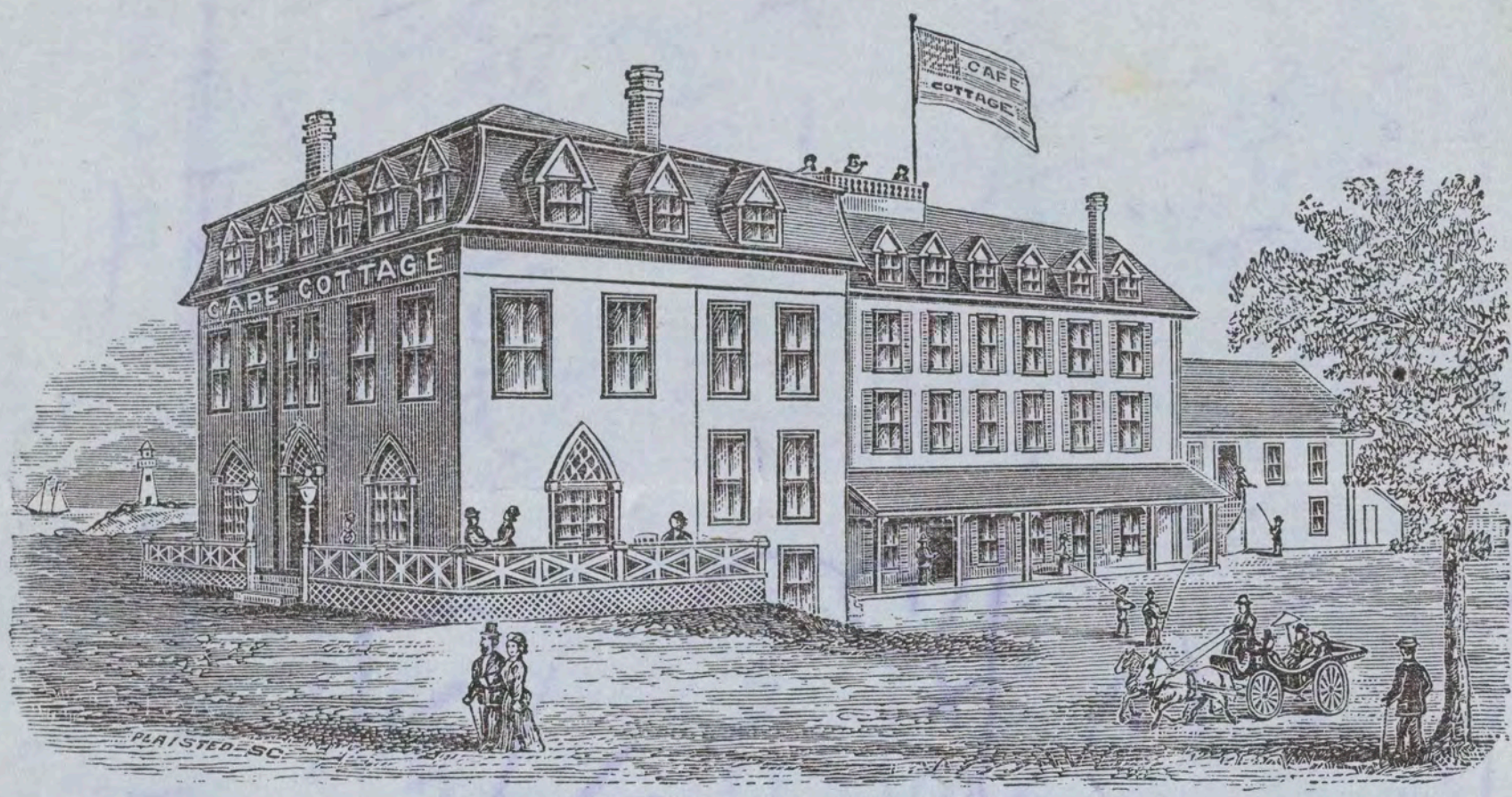
Comparison (Rumford)

1. Furs & wool,

2. Silk, 3. Cotton.

4. Linen.

~~[Exper. with phosph. lice]~~



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Address,

FRANK L. FOSS & CO., Proprietors,

PORTLAND, ME.

(2)

Fishes, temperature 1° or 2° higher than water they are in; bonito & tunny, warmer still. Some, as stickleback, warm with their bodies their eggs in a sort of water-nest for hatching.

Nursing bees, within, 22½° above air-temperature. Heap of earthworms marks or 1° or 2° above it.

Plants sometimes give out heat, especially when flowering. Philodendron Selloum, 20° to 30° F. above surrounding atmosphere, when in bloom.

(3)

Man, 100° F.; armpit, 98.5°; fevers, &c, 110, 112°, 120° (Teale). Cholera, intoxication, shock of injuries, — 77° — 77½° (the last once recorded from).

(1)

Whale, 100°; Sheep, 104°; Hog, 106°; Arctic Fox, 107°; Sea Gull, 100°; Chicken, 110°; Swallow, 111°.

Experiments show that

(A)

Ordinary open wood fire utilizes (for heating) only 5 or 6 per ct. of heat given out by the wood burned.

Coal fires 12 to 18 per cent.
Best improvements, about 30 per ct.

History of fireplaces —
Hut fire — Hole in ground —
Bazue — perfume — Hypocaust —
charcoal, smoke
Kakelung — Chinese floor fires —
Chimneys, 14th century — Big hoods —

Lemonnier — first place —
Louis Savot 1625 — Sir John Winter — not long afterwards
warm air — from outside
& Désaguliers, 1715
Gauger 1713 — combined the two
1744 & 1771
Non-smoking — Franklin, Barnett, Arnott
not Arnott
Polignac, Swedenborg, Rumford

(B

Change shape of back of fire-place to radiate better & contracting throat of chimney for better burning & less waste of fuel —

Direct smoke flue & circulating air flues —

Fondet, Condrer, Paclet, Lloyd, Falton & others —

"Fire Place Heater" utilizes 20 to 30 per cent of the heat of combustion produced —

Dominick heater somewhat less.

Jackson Fire Place over 30 per cent

Warm air Heaters — (C)

Best, smoke flues circulate,

best air flues direct

(In ventilation fireplaces, vice versa.)

Material — Cast iron,

wrought iron — vitrified terra

cotta — Conditions!

~~Conditions~~

~~Conditions~~

~~Point of Stove~~

~~Kitchen~~

~~Stove air~~

~~Thermometer~~

~~Shaker mit~~

~~Ventilation~~

~~Fresh air~~

~~Fresh air~~

~~Fresh 100~~

Stoves

Great variety —

Make sure of

good draught —

Have large stove for the room —

Keep water in pan on top stove.

Charcoal stoves — Samovars — (Jovets) —

Gas-heating — expensive but

convenient — (adding air, 12 times

as much, before burning, cheapens much)

[Photographs here]

[Photographs shown here]

Hot Water Warming

Principle — [photograph of diagram]
3 inch pipe for dwellings — 4 in. for public buildings —
Air-vents needed — at upper points —
must be supplied as needed with water —
For pipes to ascend, must close
top of boiler — Pressure ∝ height
of pipe — If bursts, not near so
bad as steam — allowance to be made
for expansion of water (small) & length of pipe.
May have any number of pipes —

Motive power small — easily interrupted —
greatest with increased height of pipes, & according to difference
of temperature of pipes & boiler —
Coils increase friction much —

Elevated cistern above boiler useful.

Warming of lower rooms needs checks
of some kind to prevent all warm water ascending —
180° to 212° usually — Permanent temp. Soft & salt water

a given bulk of steam will lose as much heat in 1 minute as same of water in 3¾ hours—

DR. HENRY HARTSHORNE,

LATELY PRESIDENT OF HOWLAND SCHOOL,

UNION SPRINGS, N. Y.,

Wrought iron boiler better than cast iron but more costly.

Will be prepared, 9th mo. (September) 25th, 1878, to receive a few young ladies to reside in his family, and a larger number as day scholars, for advanced instruction. Competent Teachers will attend, for Latin, German, French, and Drawing. There will be one school session daily, closing at 2 P. M.

Residence, S. W. corner of Shoemaker's Lane (Penn Street) and Wakefield Street, Germantown; five minutes walk from Shoemaker's Lane Station, on the Germantown Railroad.

TERMS: Boarding Scholars (per annum), $375; French and German, each, $25; Drawing, $25. Washing, 75 cents per dozen. Day Scholars: English Studies, with or without Latin, $80; French and German, each, $25; Drawing, $25. Those (either boarding or day scholars) who take both French and German, or one Modern Language with Drawing, will be charged $40 for the two branches. Drawing, French, and German *together*, $50. Payment in advance; one-half in 9th mo., 1878, and the remainder in 2d mo., 1879.

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Address,

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GERMANTOWN, PHILADA.

Copy of Hartshorne's circular

1 sq. foot of cubic ft. of air heated from 0 to 5 times as many as effective from 0 to 5 times

3½ to 5 cubic ft. of air to be warmed per minute—

High pressure hot water:— 350° to 500

Exhaust — 4 to 5 hot air.

From Hood. no. of

~~Divide cubic contents of church space~~

~~1 room by 200 to get length~~

~~in feet of pipe, four in. diam, to raise~~

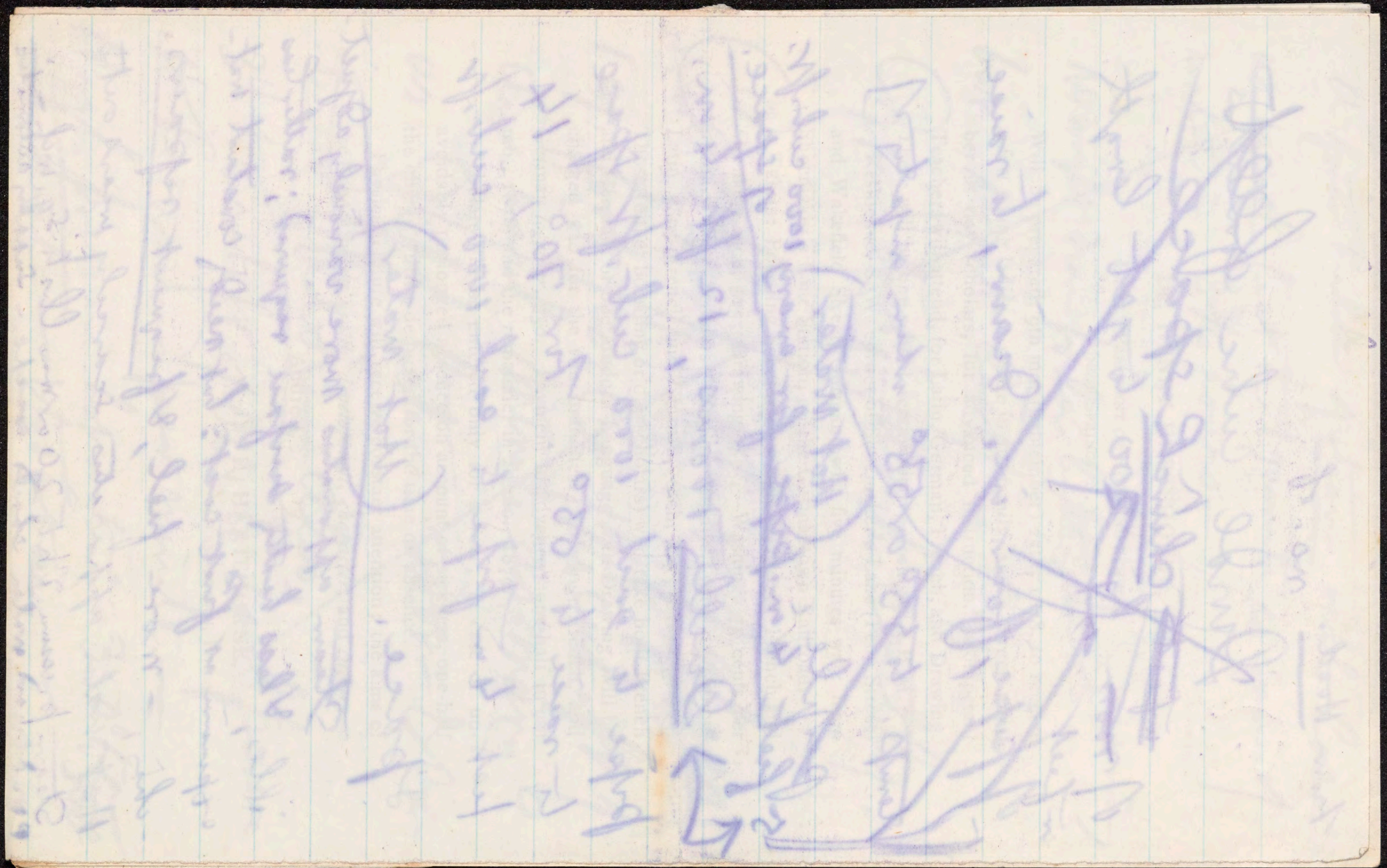
~~temp. to 55° or 58° when empty~~

~~people.~~ (Hot Water)

~~5 feet 4 in. pipe for every 1000 cub. ft. of space.~~

Dwelling rooms, 12 ft 4 in. pipe to each 1000 cub. ft space to raise to 65°. For 70°, 14 feet 4 in pipe to each 1000 cub. ft space. (Hot water)

Steam apparatus more variously adjustable, & less heating surface required; rather less expensive at first cost: but needs constant watching, — more fuel, & frequent repairs. Hot water apparatus scarcely wears out. Steam pressure 2 lb to 20 or more lbs to sq. inch — condensed water should escape — supply automatic



Clothing should be
1. Sufficient –
2. not excessive
3. Proper distrib.
4. not obstructive by pressure,
5. Permeable to air –
6. changed often, for wholesome cleanliness.
Bathing (Cold, &c)

Fires.

Old open.
~~Grates~~
Fireplaces, &c
See other
~~Papers~~
Heaters –

Hot Water – } Direct &
Steam – } Indirect –
~~Radiation~~, Conduction, Convection.
Comparison of Methods.
~~Conditions of good Furnace Warming.~~
~~Barber Model~~
~~Barker Model~~
~~Other models?~~
Photogr. views
~~Sanitarium~~
~~Books at Inst.~~?
Gas – Heating & Cooking
Floor & Wall Warming –
Moisture of the air
[Room evap. cylinder]
Best temperatures for rooms –
Diff. accord. to kind of fire, & whether still or in motion.
Habit, & clothing.
Sleeping chambers.
~~Ventilation~~

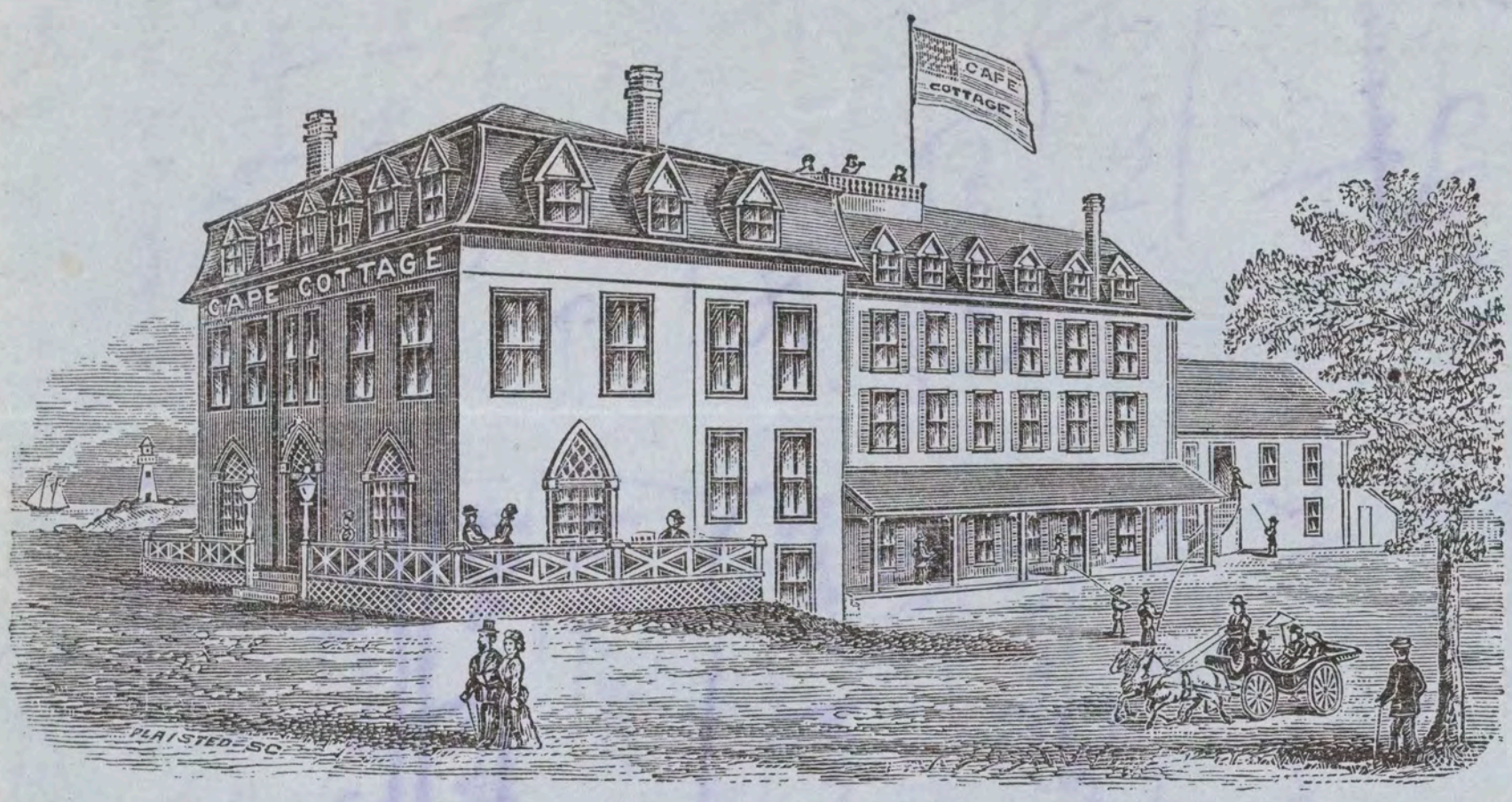
Evils of over heating.
Cooking Stove in summer.
Mistaken idea about

hardening.

True hardening is acquired like credit business; by meeting all obligations – & incurring none which cannot be met, without too much borrowing from the future.

Summary as to healthy ways of maintaining warmth of body.

Good daylight
Safety



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Human Temperature.

Blood Heat ~~of man~~,	100° F.
Arm-pit,	98.4° to 98.6°
Scarlet Fever,	104° " 110°
" Cholera,	90° " 77°
Highest recorded ~~in man~~,	120°
Lowest recorded from,	72°

Animal Temperatures.

Whale,	100° F.
Sheep,	104° F.
Hog,	106°
Arctic Fox,	107°
Sea-Gull,	100°
Chicken,	110°
Swallow,	111°

over

Temperature of Rooms.

Skating Rink,	30° to 40° F.
Gymnasium,	40° " 50°
Workshop,	50° " 60°
Sleeping Chamber,	40° " 60°
Sitting Room,	
Open Fire,	60° " 65°
Warm Air,	68° " 70°

Bodily Temperature

Raised by	Lowered by
Exercise	Sleep
Food	Fasting
Coffee	Alcohol
Fever	Cholera

2

Illustrations for Lecture on Warmth.

Bakers model —

Photographs on Screen —

from Putnam & Hood

Evaporating Porous Cylinder —

Heating phosphorus,

uncovered, &

wrapped in flannel.

Ice,

uncovered,

wrapped in flannel.

[Have ready:

bottle containing phosphorus;

× a yard of thick flannel;

× 2 pieces of ice (in butter-kettle);

× 2 spirit lamps;

× 2 plates of ~~tin~~; & props, &c.]

1st day — Take to town & fix large spirit lamp — & get tent glass tube —

get 2 zincs, 18 in × 10 in.

" 1 yard thick red flannel.

2nd day — Taking small sp. lamp —

& bottle of phosphorus —

& ~~butter~~ kettle for ice

Get at tea-time a good piece of ice

FRANKLIN INSTITUTE --
LECTURES - HYGIENE AND DIET

1881

Food &
Drink

Institute

1881

1881-2-14

Good

Franklin Institute

2.14.81.

Healthy Living —

Food,

How we should eat, How often, How much, and What to eat, and what not, and Why.

1. Manner of Eating.

Chewing well the food — especially veg. food.

Slowly — Cheerfully, — Socially —

Rest before and after,

of Mind & Body

"After Dinner sit awhile,

After Breakfast read awhile,

After Supper walk a mile" —

Energy is required for digestion.

Wiley's experiments with 2 — soups —

D. Hunter's

American Dyspepsia —

bad teeth (partly) —

2. Times of Eating.

Not of great importance,

In Edward 4th's time, 15th Century, 10 o'cl. dinner.

Queen Elizabeth's, 11 — 12 o'cl Dinner.

Now most English & some Germans 4 meals or 5 — either does, very well.

many French 2 — some 3 —

Natural order — altered by city habits & business, & gaslight —

7 & 8 — 12 — 1, 6 — 7.

about 5 or 6 hours between meals.

If hungry or empty —

a bite between.

So, if up late at night, watching with the sick.

Eat when hungry. — But be regular when you can.

a crumb in time saves

Sick headache — Neuralgia — Convulsions —

Considerable change has occurred within 40 or 50 years in the ideas of physicians as

Sick feeding

A little at once, often; — liquid — concentrated. "Low diet" = "dieting", &c. (i.e. weak diet, is a) exceptional & temporary fitness.

Milk, beef tea, chicken broth, oatmeal gruel, Arrow root, most frequent articles.

(not too exclusively nitrogenous, long never exclusively of starches).

Books on Sick Diet,

Nourishment always needed; Waste goes on, often excessively, in illness.

Stimulation not usual

always required. Mistake here common.

3 Quantity of Food.

About 2½ pounds solid (repair of waste of substance, to supply growth (in young), active & passing, including that used as fuel for heat & force)

(at least 2/3 vegetable)

2½ pints (about) of water,

adult average.

Say, – 3/4 pound lean meat,

1½ pound bread (or other vegetable food),

& 1/4 pound butter (or other fat).

Infant under 6 months will consume comfortably, 2½ to 3½ pints of milk in 24 hours.

Minimum Quantity

Comaro: — 12 oz, & 14 oz light

lived to 100 years. —

une a Quiet old gentlemanly life. Parry,

among Arctic Explorers, 20 oz.

Dr. Tanner! — Phenomenal —

B Lay — Capt Hopker —

2 weeks — 3 months on wreck

Most people will starve in 9 or 10

days — Partly from cold & distress.

~~Lieut~~ Greely's party — where 50 years average temperature

Maximum in Arctic

Fuel for animal heat (cattle);

regions: — 10 to 20 lbs fat

Meat — (tallow candles!)

Must we weigh or measure our food to get its right amount? NO.

The Know When to Stop under the provision of our nature, by Satisfac. of hunger; not of palate, or possibility, at all. Stop when you feel stomach. Should you never feel stomach (except Heart) No internal organ ought to be felt in health. Stomach is felt — either too much, too fast, unwholesome, — worried at it, or already dyspeptic.

Cannot anticipate to-morrow's dinner — or even a sufficient supply at breakfast time for a whole day. Avoid dyspepsia, wisely!

4. Quality of Food.

What we may advantageously eat.

Requisites of Foods:

1. Contain some elements of the body.

C, H, O, N, S, P, Fe, Ca, K, Na, Cl, Fl., Mg., Si, ~~Mg~~, &c.

2. Organic, except water & salt.

lime not nitrus.

Dirt-eaters. n. Europe, S. Am. Afr. — Explanation. (Churchyard beetle) Egypt

3. Mechanically reducible or reduced.

anthracite not do, tho' carbonaceous.

4. Sol. in digest. fluids —

Saliva, Gastric juice, Pancreat. juice, Bile, & intestinal fluids.

Charcoal not do (unless as medicine) tho organic & reducible: — insoluble.

5. Not poisonous; of course. No trichina in it — Cook all pork-meat.

6. Not offensive to taste or smell (Not absolute, as shown in times of famine, shipwreck, &c.)

Objects of Foods.

1. Tissue-making & repairing, &

2. Energy-producing, i.e., Heat, growth-force & motor power, brain power, &c.

Locomotive companion.

Most for force-food. Consumed in & for the blood.

Many bid, 1½ times its weight, & not growing nearly that much in a day.

Internal as well as external work.

Pick and bucket.

Groups of Foods.

1. Nitrogenous — Protein — Albuminoid — Gluten, Elastin, Protagon, Neurin — Albumen, Myosin, Elastin, Casein — [C, H, O, N] & combustible.
2. Oleaginous — Butter, Cream, fats, oils — Chiefly tissue-making
3. Amylaceous — Carbohydrates — Starch, Sugar, Gum, Cellulose (Lignin) — not Satur. unit O.
4. Saline — Table salt, phosphates, &c
5. Acidulous — vinegar, fruit acids, &c — carbonates, sulphates,
6. Aqueous — water & beverages as Tea, &c

Vegetarian Question.

1. Chemical — Possible —
2. Physiological — optional — Nature's example, milk. Young of birds & insects &c
3. Experience

Both ways — Mixed best in Extras.

Natural Model perfect food,

Milk,

It contains representatives of all the Groups of essential food-principles.

2 at least of the 3 groups must be represented for a continuous diet to be sufficient &

wholesome

Starving on milk, as arrowroot without milk

Milk has

Casein, albumin; Lactin; Butter-fat

principles — Salts, (Even acid a little, usually).

Skim-milk is stronger tissue-making food than cream.

Both should go together.

Must be pure &

fresh

[Next Lecture]

Human Bodies are not — even human Bodies — Rotten alone.

Vegetable Foods —

Bread — staff of life —

almost all the world over, & very anciently.

Contains Gluten, Starch, fat, salts —

Wheat rather ~~Completest~~ (phosphates)

especially under newer methods of milling

Superfine white flour not rich enough

Brown bread —

→ [Specimens on Tables]

Rye: — Oatmeal: — Corn —

Rice: Indian (Sutton), Chinese (Dried fish or molluscs etc.) (Lethaby!)

Faults of Bread: —

Heavy — Sour — Saline — Bitter

Mouldy — [Cooking! C. School!]

Health is wealth. Health, is more than money; a contribution of happiness.

not Kosey alone.

Other vegetable foods.

Peas & beans, — potatoes, — tomatoes, — Rice, cabbage, turnips — parsnips, egg plant, &c

Variety!!

Not at each meal or each day, however.

Sometimes — at times —

That never saw the fire. — Fruits.

Curry!

Animal Foods.

Eggs — Protoplasmic food.

Wholesome — moderately hard boiled. Proved.

Meats, strongest & most stimulating of solid foods.

Beef + (not veal)

Mutton, & Lamb. (These more fat.)

Pork? venison & Buffalo meat good —

Chicken,

Duck —

Pigeons — mo

Game birds

partridges, prair

red birds, nor

Wild anim

most especial

America has a lar

Fish —

Less strength than land animals'

meat — Phosphates (?)

Reptiles — Terrapins, Snappers —

Mollusca — Oysters —

Roast, Pound, Stew, Raw, Fried,

Clams — No! Crustacean: Lobsters —

Crabs, Shrimps —

(1)

origin of foods.

Ox — asiatic — worshipped

Sheep — " , or European?

Domestic fowl, asiatic — Hindoct.

Guinea fowl, africa

Pig — asiatic

Duck &

Goose — eastern —

Turkey — American —

Potato — american — S. Am.

~~not sweet potato~~

Maize — " ?

Sugar — oriental — saccar

Tobacco — American?

Peach — Persian

apple — eastern

Pineapple — American

over

(2)

Lumie, oriental
Pear, "
Plum
cherry
Mulberry
~~Strawberry~~, Raspberry,
Olive
wheat, Rye, Buckwheat, oats
all oriental in origin,

American

Potato
Indian Corn
Pine apple
Cocoa
Tobacco & Cinn. Bark
vanilla
Turkey
Watermelon, Cantaloupe,
Cranberry, Blackberry,

(2)

lesfoods.
tomatoes,
turnips parsnips
eggplant
each day, however.
at times

Fruits.

toplasmic food.
boiled. Proved.

Meats, strongest & most stimulating of solid foods.
Beef (not veal)
Mutton, & Lamb. (These more fat.)
Pork? venison & Buffalo meat good

Chicken, Turkey, —

Duck — Goose ?

Pigeons — moderately digestible —

Game birds — (aquatic ? sometimes fishy —)

partridge, prairie chicken, etc —

reed bird, woodcock, snipe, —

Wild animals & birds, "game"

most especially appetizing —

America has a large natural supply of game *

Fish — uncertain.

Less strength than land animals'

meat. — Phosphates (?)

Reptiles — Terrapins, Snappers —

Mollusca — Oysters —

Roast, Pound, Stew, Raw, Fried,

Clams — No! Crustacean: Lobsters —

Crabs, shrimps —

Insects!

John Baptist — Darwin's caterpillar — astronomer Lalande spider — Grasshoppers, Riley — Unknown treasures of food, yet to be valued!

Curiosities of Diet — Australians, ants, Africans, monkeys (Baker), S. amer. lizards, Chinese, earthworms, rats, birds-nest soup, Romans at Pompeii, rat — ~~Chinese~~ French, with Indians, dogs — French &c, horse-meat, coming now. — During siege of Paris by Germans, 1870 many animals of Jardin Des Plantes were eaten. —

America's contributions to the world's food: maize, white potato, tomato, cocoa, turkey, pineapple, vanilla, tobacco, cinchona, watermelon, cranberry, blackberry —

Adulterations of food

Parasites in food!

Illustrations!

Food poisoning

A good conscience, good health,

1882

gas. The experiments showed that 40 feet of gas was all that was necessary for the preparation of a dinner, and in this is included 20 feet for the top burners for boiling. Even at the price paid in this city the fuel for preparing the dinner would cost but nine cents, while in most English cities it would be less than one-half this amount. The gas required for preparing both breakfast and supper is placed at two cents more, or with us the total cost for fuel would not exceed fourteen cents a day, while it might be made much less. "By increasing the consumption of gas in the larger stove, it is easy to obtain a heat which goes up to 500° and even 600° F., but such high temperatures are no more desirable in gas heating stoves than in ordinary coal heating ranges."

The sanitary aspects of cooking by gas must depend greatly upon the nature of the gases and vapors produced during the combustion of the gas, and which impinge upon the meat. These gases and vapors are mainly carbonic acid, water vapor and sulphurous acid, accompanied, when improperly burned, by traces of carbonic oxide, acetylene, and other oily hydrocarbons. The carbonic acid is formed in large quantities, varying from 80 to 90 per cent. of the volume of the gas consumed. The water vapor amounts to about 1½ cubic feet for each cubic foot of gas burned, while the sulphurous acid formed by the burning of gas containing 100 grains ot sulphur in 100 cubic feet amounts to only 1–1340th of the weight of the gas. The sulphurous acid formed by the burning of an equal weight of coal is placed at 1–100th of the weight of coal. The production of acetylene, by the imperfect combustion of the gas, can be readily avoided by proper care in the use of the stove.

In any stove, and with any system of burners, the ventilation of the stove must be kept up, as a deficiency of ventilation may lead to the imperfect combustion of the gas; but, at the same time, there must not be too much ventilation, for such would conduce to the lowering of the temperature in the oven.

Insects!
John Baptist — Darwin's
caterpillar — astronomer's Lalande spider —
Grasshoppers, Riley —

...ARY ENGINE

Gas Cooking

a change of pressure in the boiler also effecting the pressure beyond the valve.

There is still another style of regulating valve in which a loosely fitted cylinder is made to revolve similar to the plug in a cock, but with the ends not protruding through the casing. This plug is made to revolve by the use of a diaphragm; and as it only has to rotate within the steam and is a loose fit (a small leakage not being enough to interfere with the terminal pressure), it works very closely and will give a practically constant pressure to the reduced side, no matter what the boiler pressure is.

I omitted to mention that diaphragmic regulating valves have been used in connection with exhaust systems. They may be so arranged that the stopping of the engine and the consequent decrease of pressure within the exhaust pipe will allow the regulating valve to open and admit live steam until such time as the engine again starts. They may also be used as a pump governor where the duty of the pump is not variable as for mine pumps, and can be used on reciprocating pumps without fly-wheels, where a centrifugal governor cannot be used.

[To be Continued.]

1/5 of Cost surface for boiler — surface.

COILS OR RADIATORS.

To the Editor of The Sanitary Engineer:

Charleston, West Va., *Nov.* 6, 1882.

I have a few questions to ask you. I want to heat a building, 50 feet x 100 feet. Would it heat as well by running the pipe in coils on the wall as by radiators in the rooms? also what size of boiler would be required and the best for that purpose? what size pipe should I start with and what size of return pipe? Please tell me where I can get a good book on steam fitting and heating, and price of same. Yours respectfully,

Frank Ferguson.

Side walls is better than radiators

[The same amount of pipe in long coils around the out-

A good conscience,
good health,
a good home &
a good dinner —
are the four main requisites
for happiness in this world;
and good cooking is very
important (if not indispensable
named link
for the last of this chain of
conditions.

In Institute –

Illustrations. | 1st Lecture

Food.

Glucose, Solid & liquid.

(Take in day of lecture)

Oleomargarin. (Eat on water st.)

Arrowroot & Tapioca, &c.

~~Beef Tea.~~ ~~1st lecture~~ ?

(Eat at Grahame's)

Printed large Tables – of

&c. (Holman)

Photographs for Screen, –

from Hassall, Parkes & Cameron,

~~Potato~~ arrowroot wheat

Starch-grains, measly pork, trichina,

Sugar & flour

weevil, acari, &c.

(Partridge, Photographer.)

[illegible]

1881-2-21

Lecture

on

Drink

Franklin Institute

2.21.81.

DR. HENRY HARTSHORNE,

LATELY PRESIDENT OF HOWLAND SCHOOL,
UNION SPRINGS, N. Y.,

Will be prepared, 9th mo. (September) 25th, 1878, to receive a few young ladies to reside in his family, and a larger number as day scholars, for advanced instruction. Competent Teachers will attend, for Latin, German, French, and Drawing. There will be one school session daily, closing at 2 P. M.

Residence, S. W. corner of Shoemaker's Lane (Penn Street) and Wakefield Street, Germantown; five minutes walk from Shoemaker's Lane Station, on the Germantown Railroad.

TERMS: Boarding Scholars (per annum), $375; French and German, each, $25; Drawing, $25. Washing, 75 cents per dozen. Day Scholars: English Studies, with or without Latin, $80; French and German, each, $25; Drawing, $25. Those (either boarding or day scholars) who take both French and German, or one Modern Language with Drawing, will be charged $40 for the two branches. Drawing, French, and German *together*, $50. Payment in advance; one-half in 9th mo., 1878, and the remainder in 2d mo., 1879.

Scholars will be entered only for a year; in case of unavoidably prolonged absence on account of sickness, one-half the charge will be deducted for the time of absence.

Physical culture will receive constant attention; the aims of the School being *health*, *development*, *character*, and *culture*.

Address,

DR. H. HARTSHORNE,
GERMANTOWN, PHILADA.

Drink 3

Water, Milk,
Soups, Beef Tea, &c
Tea, Coffee, Cocoa,
Alcohol.

Dump 3

I shall be very brief upon the subject of

Water, as my friend Reuben Haines has, this winter, already lectured upon it here.

A prime necessity to life itself. (Tanner)

Quantity needed for health,

is about ½ fl. oz. for each lb weight daily.

One of this amount, hot or cold, a good deal in moist food!

Man of war, 1 gall. each man per diem

½ for cooking.

For all purposes, drinking, cooking, cleaning & drainage & sewerage, — 25 & 30 gall. daily.

Used in London & Paris, about 30 gall per head daily.

In hot weather sometimes 90 gall.

Phila, — about 60 gallons or more

Water works can furnish 100 million gallons a day —

N York uses from 60 & 100 gallons per head — Croton supply over 100 million gallons daily. 104 millions in 1876. —

Schuylkill Water now

still good — but as population

grows larger, the time may come when it will

not suffice and forgeme so good a quality.

Upper Delaware some time

(now, Delaware, too near shores of

city), —

& perhaps some other supply —

Schuylkill must protect its Park.

Organic matter, in it is largely destroyed by Sulph.

acid from drainage of coal mines.

This acid, also, however, is neutralized by limestone water

from rocks through which the River & some

of its tributaries pass flow.

Kinds of Water —

Distilled — Melted Ice, & Snow —
at sea

Rain water (**Cisterns**) Spring (Sodium & Mineral)

Well (ordinary, artesian, & artesian) — River — turbidity not bad — self-purifying flow

Lake (Marsh & Swamp) Sea — Dist. it

Chicago 2 miles out

Impurities of Water.

Inorganic & Organic

Seldom very bad — Often very injurious

Salts — excessive (Sea, mica, artes. wells, alkali flats)

"Hard" waters —

Lead, Copper

Chemical subst.,

"Disease Germs" —

Sources:

Factories — Sewerages — Slaughter Houses — Wells for fecal waste

Dye-stuffs — drains, cesspools, sewers, small & large

Production, promotion & Conveyance of

Diseases by Water.

Germ Theory

Microbes
Bacteria,
Bacilli,
micrococci,
microzymes
&c

Fermentation & putrefaction

Typhoid Fever — not only conveyed from patient to patient, certainly.

Cholera — Various external causation
certainly not only produced by
Conveyance from one to another. Migratory.

Diphtheria — Promotion always
by filth, in water & air.
(& milk)

On chemical & Microscopic

examination of waters, R. Haines has
given a full exposition already in this place
(& Institute) this winter. This subject &
that of purification of impure waters, I
therefore leave for the present: merely saying that boiling
& filtration are the most available processes.

→ [~~Back~~ Next to p. 1[illegible]]

Liquid Food — other than ~~Water~~.

See leaves following this

~~under Drinks~~ ~~after Health~~

~~Chicken Soup Fruit~~ ~~on liquid foods~~

~~Soups~~ ~~in elementary~~

Objects of cooking: 1. Tenderness 2. Taste 3. Destruction of parasites

Principles of COOKING

Making of tea &c.

~~Keeping strength in, or bringing all out~~

Soups — generally too thin for invalids &c.

Chicken Soup often excellent in sickness.

not liquid food, but keeping the heart — nourishment wanted.

Beef Tea

~~For continued diet, some solid & sudden stimulant~~

Beef Essence —

Liebig's + Valentine's & Johnston's Beef Extracts

Milk

— next page —

Water

Tea — Coffee — Cocoa — Alcohol.

Milk — Natural model of a perfect food —

Contains nitrogen (Casein or albumen), amylaceous (Sugar of milk), fatty (Butter fats), & Salts.

Must be fresh, pure.

Changes:

1. Cream rises (all, only in several hours best in shallow pans, 55° to 59° F.)

2. Casein (nitrogenous) begins to decompose; (therefore maybe spoiled for safe child before souring)

3. Sugar of Milk changes to lactic acid; which gives the sour taste:

4. Acid coag. the remaining Casein; giving the curdled condition:

5. Spoils altogether (becoming curdled), sour, rancid with butyric acid, & containing ptomaines, bacteria, &c.

Deterioration of Milk.

1. Staleness (even before souring),
2. Mixing fresh with stale.
3. Uncleansed cans.
   chemical cleanliness!
4. Exposure to bad air.
5. Unhealthy cows.
6. Stalling cows (without pasture).
7. Unsuitable feeding.
8. Removal of cream.
9. Addition of Water.
10. Other possible additions.
    (Chalk, magnesia, starch, soda, salt, borax?)

Examination of Milk.

1. Appearance, smell & taste.

2. Proportion of cream rising.

3. Specific gravity (compared with water.)

4. Chemical analysis: for

1. Total solids, —

2. butter,
3. Sugar,
4. Casein,
5. Salts,
6. water.

Amount of cream, 8 to 30 per ct.

Ought to be 10, or, right good, 12.

Solids ought to be at least 12 per cent.

Lactodensimeter & Hydrometer.

Spec. grav. 1028 — 1030.

Ought to be at least 1029 when unskimmed & good.

Exact amount of cream lightens it, but not below 1028, or, lowest rare, 1027.

Whey stripped from curd, 1027 always.

Skim milk spec. grav. ought not, if pure, to be below 1029; most usual 1032.

Cream itself, 1025.

See next leaf, "Milk Inspection"

Then "Lactoscope" to compare opacity.

Also,

Condensed Milk — more than 1/3 of the water removed by evaporation. Various, however.

1 spoonful to 6 water.

Boundary obtained by proportion of 4 or 5 lbs milk.

Here exemplify testing milk, for cream rising, specific gravity ("Lactometer" & Hydrometer) acidity —

Show also, Condensed milk Nestle's food —

[illegible]

[illegible]

[illegible]

[illegible]

~~for Black Board.~~

Milk Inspection.

~~Fresh~~ Milk ~~has~~ with good taste & smell, opaque white (or yellowish-white) appearance, specific gravity 1029 or 1030, when skimmed, specific gravity 1030 to 32, and 10 per cent. of cream, ~~& cream~~ ~~2 hours it~~ should be pronounced good.

With spec. gravity 1028 & cream 12 per cent. or more, it should not be condemned.

With specif. gravity 1028, & cream less than 8 per cent., suspicion exists of partial skimming & watering. If specific gravity is 1027, it should be condemned, unless an extraordinary amount of cream rises: = 20 per cent. or more. In case of legal prosecution for

penalty, lactodensimeter 1027 & cremometer 6 should condemn without need of analysis. Lactodensimeter 1028 & cremometer 7 or 8 should cause suspicion & require analysis:—to ascertain 1. total solids; 2. fat; 3. solids not fat.

Minimum allowable total solids, 11.5 per cent. by weight; normal amount, 12.5 (12.98) per cent.; 9.3 (9.2) not fat, 3.2 (3.1) fat. Ascertained, by 1. evaporation; 2. dripness, weighing & dissolving out fat with ether & weighing again; 3. evaporating ethereal fat-solution, & weighing residuum. 1. gives total solids; 2. solids not fat; 3. amount of fat. [Donné's Lactoscope. next, p. 8.]

Milk - Analysis (Wanklyn.)

Casein in milk principal nitrog. princ.;
coag. with heat is albumen.
very little alkali in milk.
Casein chem. united with phosph. calc.

(Milk-sugar crystallizes — is much less soluble than cane-sugar — & less heavy: 1.53 spec. grav.
Cane-sugar 1.606.)

2/3ds of milk ash phosph. calc.;
the rest mainly chlorides.

Compos. of milk pretty constant.
Under low diet, first lessens quantity.
In this like blood, unlike urine, which is easily made to vary in compos.

Density of milk fat 0.9, water 1.
Specific gravity of urine, normally, 1025,
Milk density may be let down with cream as truly (but not so far) as with water.
Strippings may have spec. grav. 1020;
often 1025. (Cream 1025 — skim-milk 1029 to 1032.)

Trick — partially skimming milk, & then adding a little water so as to bring [redacted] to required spec. grav.

Small change in density corresponds to great change in composition.

Lactodensimeter (alone) fails.

Creamometer (Wanklyn) always not sufficient to correct it, because watered milk sends up its cream readily. [Surely not so much cream as to account for too low density.]

Analysis alone decisive (Wanklyn) &c.

To get total amount of solids; of solids not fat — & of fat. Special analyses further, not commonly essential.

Needful: Pipette; balance; small platinum dishes; a water bath.

Evaporate a known weighed amount. Deduct weight of residue from whole = water.
(This takes boiling heat in water bath for 3 hours)

Treat residue from evaporation to dryness with pure ether.

Filter; evaporate ethereal solution carefully — & weigh its dry residue: = fat.

Deduct weight of fat from whole weight of solids: = solids not fat.

[ascertain loss of weight by action of ether in dissolving out fat; i.e., after also drying ether away. This will give amount of fat withdrawn, & also solids not fat.]

H. Ho

Casein may be determined (Wanklyn) by extracting (after fat out) milk sugar & soluble ash with first strong alcohol then hot water; then filtering, drying residue, burning. Loss of weight then shows casein. Or, by amount of albumin & ammonia.

Milk-sugar got by obtaining weak alcoholic solution (as above) by filtration. — evaporating this to dryness — & igniting. The weight thus lost represents amount of sugar,

Or the milk has its casein separated by gentle warming & adding a little acetic acid, filtering.

Then dilute the residue with 9 times its vol of water. Dilute a measured quantity of standard Copper solution with 4 times its vol of water & heat to boiling. While boiling drop into it above solution of residue, & so on adding till blue color leaves the solution — copper being exhausted.

This process not necessary (Wanklyn).

amount of
Milk ash got by igniting
total milk solids & subtracting
weight lost, which is of casein, albumen, fat & sugar

Watering diminishes ash; as
ordinary (river or other) water contains
much less mineral matter than
milk. So careful determination
of ash will confirm other proofs of
watering.

Normal milk contains (Wanklyn)
(parts) 12.5 solids
87.5 water.
of the 12.5 solids, 9.3 parts not fat,
& 3.2 parts fat.

No good milk will yield less
than 11.5 parts of solids in 100 parts.
Watering reduces solids not fat; skimming, the fat.

Wanklyn asserts town-fed (stall-fed) milk considerably richer in solids than country milk; 1/4 per cent. or more often. Wanklyn has found cream from individual cows sometimes twice as rich in fat as in other instances. Fat is the most variable of all ingredients in milk, spontaneously. [But in a dairy supply, from several cows, such considerable variation will not occur, without wrong treatment or skimming. When much water is added to cream, it grows much lighter. When only a little, as 1/4, which is = N. York average watering according to Chandler, since (as Wanklyn asserts), the watery part of cream is of same composition as that of the milk,

the cream of watered milk should be lighter if not before also skimmed, but heavier if before skimmed, because the fat of cream is lighter than water. Take away say ½ the fat, the cream should be of greater specific gravity. Yet, if watering & skimming both have been done, as the former lightens the milk & cream, while the latter makes both relatively denser, by removing the light fat, specific gravity alone may fail to determine the adulteration. [With the cremometer, I should think error must be mostly avoidable. Milk with abundant cream (Voelker) is still always heavier than water & than watered milk. Donné's lactoscope.

If, then:

a specimen of milk yields with the creamometer less than or not more than 8 or 10 per cent. of cream, after standing 24 hours; if it has a specific gravity as low as 1027 ~~(or even 1028)~~; and its <u>skimmed</u> milk has a specific gravity of 1028 or less; we may be very confident that it has been watered. If its cream does not rise to more than 4 or 5 or 6 per cent., it has been partially skimmed or was poor to begin with.

For: good milk should have 10 to 12 per cent. of cream to rise; & should have a specific gravity of 1029 (1028—1030) & its <u>skimmed</u> milk a specific gravity of from 1029 to 1032. [<u>Lactoscope</u> of Donne.]

London Condensed Milk

(Franklyn)

In 100 parts by weight —

Water	51.12
Fat	12.11
Casein	13.64
Milk sugar	20.36
Ash	2.77
	100.00

Preserved Milk.

Water	20.5
Fat	10.4
Casein	11.00
Milk sugar & Cane Sugar	56.01
Ash	2.00
	100.00

over

According to above —

Condensed milk contains a little more than 50 per cent. water. As fresh milk has about 87 per-cent water, 37 per cent of water is the difference. 37 = 3/4 of 50, = 3/8 of 100 or whole amount of the condensed article. By weight, then, not more than half its own weight of water added to the con-densed milk should make it of the strength of fresh milk. Sure, however, it is a good deal heavier than water, a large bulk of water is required. Experience favors adding about 1 tablespoonful, or at most 2, to 6 tablespoonfuls of water.

Ewes, Goats, Buffalo's, Mares & asses' milk also used in different places.

Tartars drink Mares milk; in Egypt, many people use buffalo's; in many other localities, goat's & ewe's. Ewe's strongest & richest; goat's very near it, however. Ass's weakest in nitrogenous matter, but nearest to human milk.

For infants, add to cow's milk a little sugar; if very young, or digestion slow or imperfect, a little water, or barley water, or oatmeal gruel, according to its condition; if acidity present, lime water, which is quite safe usually.

Condensed Milk (foot of p. 8)

Why?

A natural want —
not necessarily always wisely met —

Fatigue — Depression —
In our grown up, working & worrying days,
Periodical fatigues, & occasional
also & So we wish for not only food, but
also refreshment of tired nature!
Then: What, How much, When &
How much?

Tea, Coffee, Cocoa, Alcohol —
(others of various parts of the world)

not drunk usually

Betel nut (areca)
Coca [shew specimen]
Opium — (often dissolve in laudanum or morphia solution)
Hashish
Tobacco
Bazar Mixt of Sondan

Non-inebriant Beverages.

Tea – Thea viridis & bohea

Coffee – Caffea Arabica

Cocoa – Theobroma cacao

Maté – Ilex Paraguayensis

N. American Tea – Ilex Cassine

Grape-vine leaf Tea

Coffee-leaf Tea

~~American Tea – Ilex Cassine~~

~~Chicory – Cichorium~~

Guarana – Paullinia sorbilis

Abyssinian Tea – Catha edulis

Labrador Tea – Ladum palustre

Tasmanian Tea – Myrtaceæ

Chicory – Cichorium Intybus

Photograph on Screen now

Theïn or Caffein

in Tea — Coffee — Maté — Guarana

Ilex Cassine — Kola or Goora nut

of Soudan —

Photographs on Screen here

Place

Tea —

most in China, Russia, Holland & England;

Composition (Theine, Vol. Oil, Gluten, Starch, Fat, Tannic, Cerebro-spinal stimulant)

Effects (retard tissue-changes?)

Best reme. refreshes.

Coffee —

especially in the Mussulman East, including Turkey, & in France, Germany, U.S. States;

Composition (Caffeine, Vol. Oil, Gluten, &c)

Effects — Cerebro-spinal stimulant

(also increases heart's action, strengthens muscle, & stimulates spinal or reflex)

Cocoa — (or Chocolate)

largely in Central America, Italy & Spain.

Composition — Theobromine, Fat, Starch, Gluten.

Not much stimulation, nutritious

safe.

Alcohol

Composition — Elements, C_2H_6O. Possibilities? — not food in health: may be in some diseases. Present in Beers, Wines, Spirits — (Formula of Distilled). — Strength of these (Table) —

Actions on the system: 1. stimulant & exhilaran. — 2. Hypostatic — 3. Narcotic — Also, retrogradation of tissue change. [This, in health, bad; good only when waste is excessive.]

B. W. Richardson — overwork of heart — 150 foot-tons waste every day when drinking. Parkes, lowers muscle strength — Many, reduction of temperature, — Worse than useless in health (against cold, heat & malaria &c) — Sometimes most useful in disease.

Alcohol (abridgment – 1875).

Extreme views, ▷ popularly facts not well understood.

The truth of science is the only right basis of hygiene, best also for interest of morals.

1. Is alc. or can't be a food?
   compos. —
   expensive. —

2. Effects: immediate; — stim., — exhil., — inebr., — stupifying (coma);
   Analysis: musc. str.; heart; — chim. or abs. of hab.
   when prolonged; — deter. tr., — gout —, alcoholismus, methomania —
   (not intrinsic peril) except when hereditary.

3. Action in disease: prostration (hemorrh.) phthisis — low fevers.

4. In health — always injurious — (Anstie)
   more or less :: quantity — frequency — time — age —
   signs of injury: — pulse — face — head.

5. Valetudinarians — aged — Hygienic doses.

6. Beers, Wines & Spirits. Prohib. spirits.

150 pr. tons
Anstie labor
heart Daily
under alcohol.

Tobacco — Opium — Climate — Cult. urine — Legislation.

Is alcohol passed through unchanged, or used, changed, destroyed, or oxidized?

N. S Davis, E Smith, Inspr of Excise, Lallemand, Duroy & Perey — passed unchanged.

Duchek, changed to aldehyde —

Böcker & Moleschott, partly excreted, partly oxidized in the blood; "burned off."

Parkes admits that Schulinus, Dupré & Anstie have proved that it is at least partly destroyed in the body.

(Bechamp has found alcohol in urine of a person totally abstinent from it)

(See tables of strengths)

Bottles ether is pineapple essence
Pelargonic, quince
Amylic nitrate Jamaicella pear essence, &c

Different effects in health & in disease, & " " always, of small or large doses. (4

Alcohol causes its injury (all is accumulated good health, especially in early life)

Probable length of life.

Dangers: — Delir. tremens — Gout — chronic "alcoholismus" (liver, kidneys, brain) — Inebriety (hereditary predisposition) — Dangers: amount, frequency, time of life, & time of day.

Signs of excess — flushing, quick pulse, — "getting into the head" —

Conclusion: If in my power I would shut up all bar rooms, & leave alcohol to the prescription of physicians — at least until, perhaps, a century hence, man may grow wise & safer in self control.

Here next, p. 14 1/2

It seems to me it might be better for the world, if it were possible that all the good, great as I believe it to be, ~~that~~ ~~it is~~ that alcohol can do as a medicine were lost to or withdrawn from mankind, if at the same time all the harm done by its unnecessary and excessive use ~~in~~ health might be prevented.

But this total withdrawal of it from the world is not possible. The great conflict between temperance and intemperance must go on; and all good men should wish for the speedy triumph of temperance.

Blackboard (?)

14½

Young people, in health, are better without tea or coffee.

For adults generally, tea is the more innocent beverage; coffee for times of unusual fatigue.

All persons in good health are better without alcohol.

Its use in disease requires much judgment and caution.

No one who uses alcoholic drinks when in health is safe from the terrible evils of intemperance.

(Back to p. 15)

(Book No. 12)

For Health's Sake

Eat – when hungry:

slowly, – chewing well;

enough – never more;

simple, wholesome food;
with a cheerful mind;
in good company;

on a clean table;

in an airy room.

Drink, when thirsty:

pure cold water,

pure fresh milk,

cocoa;

~~coffee hard drinks~~ tea;

when extra tired, coffee;

never intoxicating liquor.

~~Institute~~ –

Illustrations 2nd Lecture

On Drink.

Coca-leaves – ~~Specimen~~ – (Graham)

Beef Tea — Specimen.

Milk: a Pint or two, fresh.

Lactometer (sensi), Hydrometer,

~~Litmus~~ Paper,

Cremometrical Glass –

(use of them all)

Condensed Milk. Nestlé's Food

On Screen:

Milk-corpuscles, –

Cream, ditto,

Yeast-plant (2 views)

Tea-leaves,

Coffee & Chicory } 4 slides.

Tables of &c (Holman)

A good conscience
Good health,
a good home &
a good dinner —
are the four main requisites
for happiness in this world:
good cooking is very im-
portant to the last link in
this chain of conditions.

1880

SYDNEY

(Australia)

International Exhibition

1st PRICE

GREAT MEDAL

awarded to

HENRI NESTLÉ

Vevey (Switzerland)

FOR

MILK FOOD

and

CONDENSED MILK

NESTLE'S MILK-FOOD

LACTEOUS FARINA

Gold Medal    **Paris 1878**

TRADE MARK
REGISTERED

COMPLETE ALIMENT FOR CHILDREN OF TENDER AGE

OF WHICH THE BASIS IS

THE BEST MILK FROM SWISS COWS.

The only one to which a Medal and a Diploma were awarded at Marseilles by the Society for the Protection of Infancy.

HENRI NESTLÉ

VEVEY (Switzerland). **LONDON, 7 Barbican.**

Unsuitable and injudicious foods are one of the principal causes of the great mortality among children of tender age.

During the first months, the mother's milk will always be the most suitable nourishment, but where this from any cause is not available, **Nestlé's Milk-Food** is the only food to which every mother anxious to bring up her child, ought to have recourse.

The careful analyses, made by the most learned chemists of England, France and other countries, have proved that **Henri Nestlé's Milk-Food**, in its composition, shows a close resemblance to mother's milk, and that it contains all the Elements of a complete nutrition, under the most assimilable form.

The basis of **Henri Nestlé's Milk-Food** is choice milk from Swiss cows, concentrated in a vacuum at a low temperature, so as to preserve its original valuable qualities unchanged. With this concentrated milk a little sugar and some specially prepared wheat are then thoroughly incorporated. The wheat used contains its several feeding constituents in a very soluble and most available condition, and the food, when its preparation is complete, is found to be of the highest nutritive value. It has received quite an official recognition in Paris, where Dr Parrot, the Consulting Physician to the Board of Hospitals, who had been commissioned to investigate the subject of Infant's food, has reported most strongly in favor of this composition (milk, wheat, sugar) as the best preparation for the nutrition of young children.

Henri Nestlé's Milk-Food affords complete nourishment and is of easy digestion. All the trials of it in the Maternity and Infant Hospitals of **London, Paris, Vienna, Berlin, St-Petersburgh and New-York,** have been crowned with complete success. The medical Officers and Directors of these establishments, the Drs **Woodman, Monod, Morpain, Duchaussoy, Friedinger, Martin, Sonnenschein,** and others have been pleased to speak in the highest terms of approval concerning **Henri Nestlé's Milk-Food.** They consider it to be a product of the most wholesome character and entirely preventive of Diarrhoea, Indigestion, Sickness and intestinal inflammation.

Professor Lebert, of Breslau, Corresponding Member of the Academy of Medicine, after a series of conscientious experiments and after obtaining highly favourable results has made known by a publication entitled « **Milk and Henri Nestlé's Milk Food** » the advantages of this rational and scientifically prepared aliment.

He has written with much reason to the following effect:

1. **Henri Nestlé's Milk Food** is preferable to human milk, if the latter is not from a good wet-nurse, because it is the most simple, suitable and complete aliment.

2. If the mother's or nurse's milk is insufficient, it will constitute the best aid in supplying a mixed alimentation.

3. It will help in a very remarkable manner during the trying period of weaning.

4. In large cities or in places where milk is absolutely wanting, a rational employment of **Henri Nestlé's Milk-Food** will ensure the growth and proper development of children; in this manner, parents may themselves contribute to stop the frightful mortality of children, a mortality often due to the ignorance and inefficiency of the nurses to whom they have been confided.

All children fed with **Henri Nestlé's Milk-Food** are remarkable for muscular strength, firmness of flesh and a lively appearance; they are free from diarrhoea, vomiting, pimples and other affections of the skin.

These facts explain its success in England, France, Germany, Russia and America; wherever its use has been adopted, this valuable invention has satisfied a great desideratum in the nutrition of children.

DIRECTIONS FOR USE.

Its preparation is very easy, for it only requires to be mixed with water, then to be boiled for a few minutes with continued stirring.

A table-spoonful of the powder mixed with ten table-spoonfuls of water, forms a food to be given in a feeding bottle.

A table-spoonful with five of water produces a pap.

Regularity should be the rule of a good alimentation for children, their food ought to be given often and in small quantities at a time, in order not to load nor fatigue their stomachs.

If the child is predisposed to constipation, then **Henri Nestlé's Milk-Food** is to be given thinner, if subject to diarrhoea, it should be thicker.

Beware of imitations.

Every box has the trade-mark on, and the signature of the inventor over, the label.

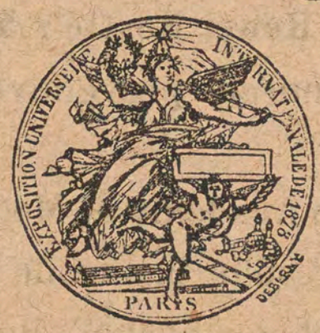
HENRI NESTLÉ

Messrs **Thos Leeming & Co, Montreal Canada.** Sole agents in British North America.

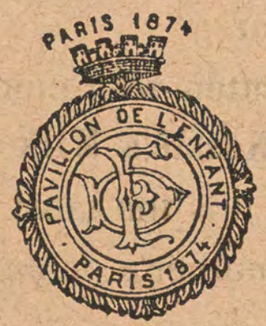
Vevey — Imp. Lœrtscher et Fils

NESTLE'S MILK-FOOD

LACTEOUS FARINA

Gold Medal    **Paris 1878**

TRADE MARK
REGISTERED



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Air

In Relation To

Health.

Franklin Institute

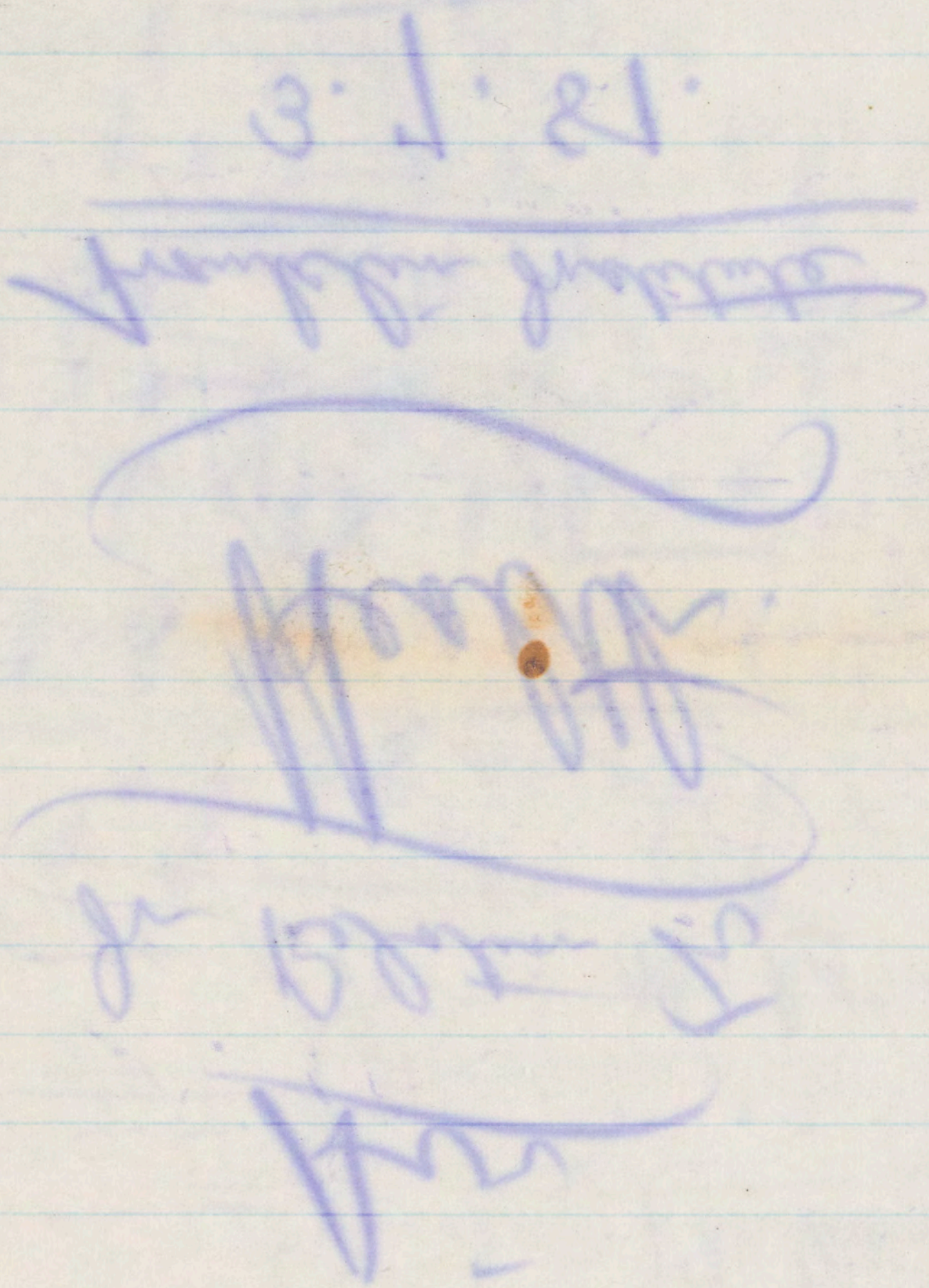
1881

1881-3-7

Air
In Relation to
Health.

Franklin Institute

3.7.81.



Supplement to Last Lecture [On Warming]

on clothing — (pressure) — tight lacing. Also, feet warm.

Furnace heaters, must not leak gas, or give it to air chamber (when fresh air is put on to)!

Hot water a very permanent, slowly cooling temperature; steam gives off (same bulk) as much heat in a minute as hot water in 3½ hours. ~~Steam more fuel also.~~ Heat may be excessive like red hot air heater. ~~Either hot water or steam direct or indirect.~~ Best combination: warm air & open fire — wood or coal grate, over

Neither ventilation

Warming by gas.

Convenient but expensive in cold weather. Summer cooking by gas may not be so.

Hydrogen gas heating.

My proposition at F. Institute in 1854. Pub. Ledger, June 17, 1854.

Put off then on account of greater cost of coal. Reasonable however as highest combustion heat of all such stoves, & only water produced as result of its burning. It alone therefore, needs no special ventilation; as illuminating gas does. With 12 times as much air added, great heat.

Air in Relation to Health.

Large Subject!

1. Why do we need ventilation?

Answer — for the same reason that we need to breathe: life involves change, oxidation, combustion, we are a heat engine.

Viz. Because O into blood, CO_2, H_2O & org. matter out —

Fill air, a gallon a minute — 5 or 6 stone, gas burns — stone 20 4 25 gallons

Experiments —

1. Making Carbonic acid gas — ($SHO_4 + NaCO_2$) putting candle out —
2. Breathe into limewater.
3. Burning matches between fingers, and covering them — out.
   Same with cover over candle end.
4. Breathing into a glass — & candle extinguished.
5. Draught, in double tin tube with candle.
6. Glass house with candles in it

Effects of bad air:

Immediate: — Death —

(Poisoned by CO_2 & Organic matter.
Beer vats — old wells —
Grotto del Cane — Black Hole &c

Slow: — promoting dangerous diseases, & aggravating them.

Diphtheria, Small pox, Typhus & Typhoid & Fevers —
Cholera, Yellow fever, — (Measles,
Whooping Cough &c), also
Pneumonia, Bronchitis &
Consumption!

1/4 of deaths, from bad air —
N.Y. tenement houses: 4 or 500 in one house! } 1/2 population —
} 2/3 mortality —
× (Philada. statistics) —

Philada, Statistics of Typhoid Fever.

15th & 20th wards, combined population of 100,000, annual mortality from typhoid fever averages in 10 yrs a little more than 4 in 10,000; 18th & 19th wards, in which Sewers empty into the river, with combined population of a little over 70,000, annual mortality over 7 in 10,000.

What is air?

See List of constituents
also — extracts about spores.

amount of Carbonic acid gas —
normally, 3 or 4 parts in 10,000 —

See Table of excesses.

Organic Matter the worst of all.

Sources of Air-foulness

See List of these,
~~[illegible]~~

Dwell on some of them

National Hotel Epidemic, 1856

Cholera, Baltimore, 1848.

Bigelow's Lib. 1866

Examples of improvement — Boston

City Hospital —
mortality surg. opers., 1/2

London Foundling Hospital
2000 in 7000 down
to 300 —

How to provide pure air.

In-doors: by either spontaneous or artificial Ventilation.

What are Nature's processes?

1. Diffusion; 2. Winds: these produced by differences of temperature.

Diffusion; too much o-verlooked. Explain it. - Con-stantly acting with heat-movements.

Breath in a room.

Smoke in a room

[Show its movements]

Contents Of
the Atmosphere.

~~Relatively Constant~~:

Oxygen $\frac{1}{5}$ 20.8 to 20.51

Nitrogen $\frac{4}{5}$ 79.2 " 77.95

Variable:

Carbonic Acid

Watery Vapor

Ozone

Non-Essential:

Iodine, Nitric Acid, Ammonia

Carbo-~~Sulphur~~ and Sulphu~~ric~~ Hydrogen

~~Phosphuretted Hydrogen~~

Sulphurous and Sulphuric Acids

Mineral Particles

Organic Vaporous Matter

Organic Forms.

Orchestra

Market Market

Chapel Chapel

Studio:

Kirkwood St.

Orchestra St.	50'0 & R 50'0	
		38'11" 38'5"

Amount Expended:

Contractor: H. Mainwaring.

Contract No. 10 Amount

Douglas Cunningham

be heard all along the coast the sound of the Bâroem, a great wooden gong, announcing to the islanders the departure of the "man-in-the-moon," who had taken up his abode for more than a year amongst them.

JOHN C. GALTON

MICROSCOPIC EXAMINATIONS OF AIR

A WORK* of the greatest importance on the above subject has just been published in Calcutta by Mr. Douglas Cunningham. The conclusions which he has reached as the result of the experiment are so valuable that we deem it right to give them as great publicity as possible. The following is Mr. Cunningham's description of the aeroscope with which he made his experiments :—

The apparatus employed in obtaining specimens was a slightly modified form of that devised by Dr. Maddox. It consisted of three thin brass tubes, two of which slipped over the third central one and came into contact with the opposite side of a projecting rim on its circumference. This rim was formed by the margin of its diaphragm which divided the centre tube into two chambers. It was of sufficient thickness to allow of a spindle passing up through it. The latter terminated in a pointed extremity, which came in contact with the upper end of the bearing, and provided for the free rotation of the system of tubes. Round the margin of the diaphragm there was a set of perforations, to allow of the passage of air through it, and, on the centre of its anterior surface, there was a square plate of glass with a slightly projecting rim on its lower margin. The anterior of the two lateral tubes was provided with an expanded orifice, and contained a small, finely pointed funnel in its interior; the pointed extremity opening immediately in front of the centre of the diaphragm-plate. The posterior tube was quite simple, and had a good-sized fish-tail vane fitted into a slit in its extremity.

The following are Mr. Cunningham's conclusions :—

The most important conclusions to be derived from all the preceding experiments regarding the dust contained in the atmosphere in the vicinity of Calcutta appear to be the following :—

1. The aeroscope affords a very convenient method for obtaining specimens really representing the nature of the true atmospheric dust.

2. Specimens of dust washed from exposed surfaces cannot be regarded as fair indices of the constituents of atmospheric dust, since they are liable to contain bodies which may have reached the surface otherwise than by means of the air, as well as others which are the result of local development.

3. Specimens collected by gravitation also fail to indicate the nature and amount of organic cells contained in the atmosphere, as the heavier amorphous and inorganic constituents of the dust are deposited in relative excess due to the method of collection.

4. Dew also fails to afford a good means of investigating the subject, as it is impossible to secure that all the bodies really present in a specimen of it should be collected into a sufficiently small space, and, moreover, because it is liable to accidental contaminations, and also affords a medium in which rapid growth and development are likely to take place.

5. Distinct infusorial animalcules, their germs or ova, are almost entirely absent from atmospheric dust and even from many specimens of dust collected from exposed surfaces.

6. The cercomonads and amœbæ appearing in certain specimens of pure rain-water appear to be zoospores developed from the mycelial filaments arising from common atmospheric spores.

7. Distinct bacteria can hardly ever be detected among the constituents of atmospheric dust, but fine molecules of uncertain nature are almost always present in abundance ; they frequently appear in specimens of rain-water collected with all precautions to secure purity, and appear in many cases to arise from the mycelium developed from atmospheric spores.

8. Distinct bacteria are frequently to be found amongst the particles deposited from the moist air of sewers, though almost entirely absent as constituents of common atmospheric dust.

9. The addition of dry dust, which has been exposed to tropical heat, to putrescible fluids is followed by a rapid development of fungi and bacteria, although recognisable specimens of the latter are very rarely to be found in it while dry.

10. Spores and other vegetable cells are constantly present in atmospheric dust, and usually occur in considerable numbers : the majority of them are living and capable of growth and development ; the amount of them present in the air appears to be independent of conditions of velocity and direction of wind ; and their numbers are not diminished by moisture.

11. No connection can be traced between the numbers of bacteria, spores, &c., present in the air and the occurrence of diarrhœa, dysentery, cholera, ague, or dengue ; nor between the presence or abundance of any special form or forms of cells, and the prevalence of any of these diseases.

12. The amount of inorganic and amorphous particles and other *débris* suspended in the atmosphere is directly dependent on conditions of moisture and of velocity of wind.

If these results be compared with those obtained by other observers, and detailed in the first section of this report, it will be seen that they agree very closely with those of M. Robin, only differing from them in indicating the presence of a somewhat larger number of spores than appeared in his observations. They differ almost equally from those arrived at by Pouchet and Ehrenberg. It is somewhat difficult to understand how the former observer so constantly failed to detect the presence of spores in his experiments, but there is an apparent reason for Ehrenberg's observation of the predominance of animal forms in the atmosphere. His conclusions appear to have been almost entirely founded on the results of the examination of specimens of dust not directly obtained from the air, but from surfaces on which it had been previously deposited from the air, such as leaves, tufts of moss, &c. Now, as has already been indicated, it is certainly quite unwarrantable to assume that all organisms found in such specimens existed as such in the air, or were even derived from the air in any way. All such surfaces are more or less liable to contact-inoculation ; leaves and moss, for example, are liable to this through the agency of insects or birds. Moreover, with regard to many of the organisms detected in such situations, it must be recollected that there is no reason why they should not have arrived there by means of active progression over the surface. When surfaces are wet with rain, there is no reason why Tardigrades, Rotifers, Anguillulæ, and many infusoria should not travel over them from one point to another. The journey accomplished at any one time may be small, and its progress soon arrested by defective moisture; but, unless they are deprived of vitality in the interval by desiccation, they are ready for a fresh start when favourable conditions are again presented to them.

It is hardly safe to venture on the vexed questions regarding the origin of bacteria, but it may, at all events, be stated that the results of the present experiments are certainly not opposed to the belief in the transmission of these organisms in some way or other by means of the atmosphere ; for they were actually observed among the particles in moist air, the addition of dry dust to putre-

* Microscopic Examinations of Air," by D. Douglas Cunningham, M.B. Surgeon H.M. Indian Medical Service (Calcutta).

Dr. Maclay told us of one curious custom which he does not mention in either of the two papers referred to in the note. The Papuans, though they know how to produce fire by rubbing together two pieces of wood, do not do this when they require this agent, but always carry their fire literally about with them, either trailing a lighted stick after them as they walk, or placing the same under their beds when they sleep.

Dr. Maclay, despite much pains, was only able to collect ten skulls, and only two out of these had the lower jaw, for the natives preserve this with great veneration, while the skull itself is thrown into the neighbouring jungle as a thing of no worth. The skull of the Papuans of Maclay coast is "dolicho-cephalic." The superciliary eminences are frequently very strongly developed The maxillary region is prognathous, so that the upper teeth project considerably beyond those of the mandible. The Papuans are of middle stature, the females being considerably smaller than the males, but are strong and well built.

Contrary to what has been written, there is no roughness of skin considerable enough to constitute a race characteristic; which may be largely accounted for by the custom of smearing the bodies with a kind of earth, and to the frequency of psoriasis ("masso"). The colour of the skin too is in general of a light chocolate brown, and not of a bluish-black colour as has been previously asserted. The inhabitants of New Ireland, an island not far distant, have, on the other hand, a comparatively dark skin. The scars of slight wounds, *e.g.* such as are made with a red-hot coal, are somewhat darker than the surrounding skin, while deep wounds, which are of not infrequent occurrence, leave behind them scars almost white in colour.

After a series of very careful observations, made as well upon shaven as upon well-covered scalps, Dr. Maclay concludes that the hair is not naturally disposed, as has been represented, in tufts or clumps, but grows just as it would upon the head of a European. The length of the hair, too, varies in different individuals, for while one man is fain to cover his bald pate with a cuscus,* another is proud to display a "gatessi," which luxuriantly covers his shoulders.†

The natural colour of the hair is dull black, but this is marked, after the period of childhood, by a black ("kuma") or red ("surru") dye. The hair of children is covered with a wash of ashes and water for protection against lice; this hardens into a thick crust. In the case of males this is continued till the time of circumcision, after which period much care is bestowed upon the coiffure. The women, oddly enough, expend no pains upon the arrangement of their hair. The eye-brows are generally shaven, and the hairs of the beard are either shaven or plucked out in the young men, but are permitted to grow among adults.

The general hair-growth upon the body seems to be more scanty than it is among the Caucasian races. Though hair is never seen on the back of the hands, it sometimes grows pretty thickly along the line of the vertebral column, and is sometimes so far extended as to cover the whole of the buttocks.

With regard to the physiognomy, the forehead is not high but small, and sometimes retreating; the nose is broadly flattened out, frequently with dilated nostrils; the mouth is broad, and has a projecting upper lip; the chin is retreating, while strongly projecting cheek-bones strikingly contrast with the smallness of the forehead in the temporal region.

The Papuans of Maclay coast bore a hole through the septum of the nostrils, in which a long fragment of stone or piece of shell is worn. The teeth are much worn through the almost exclusive use of a vegetable diet: Dr. Maclay noticed this in his own teeth after a stay of eight months in Papua. The lobules of the ears are pierced at an early age by means of the thorn of a *Dioscorea* and become much elongated by having to support heavy ear-rings.

If the back of a Papuan is seen in profile, there will be noticed a considerable concavity of curve in the lumbar region. This would seem to be a characteristic in which the Papuan differs from the Caucasian race. The Papuans make a greater use of the left hand and arm than of the right, and use the feet to pick up various objects—sometimes very small ones—from the earth. This is done, not by flexion of the toes, but by anadduction of the great toe, which is considerably separated from the rest of the toes. From this use of the,toes, it frequently happens that the two feet are dissimilar in size.

Circumcision is performed at from the ages of 13 to 15 years, and, as Zipporah performed it, with a sharp flint. This custom is general among the Papuans of Maclay coast, and among most of the coast and some of the mountain inhabitants. Those—and among them are the New Irelanders and the inhabitants of one of the Islands of the Archipelago of Contentment—who do not use this rite are looked down upon by their circumcised brethren. The suckling of infants is carried on for a long period, sometimes to the age of four years.

The Papuans are very strict in their sexual relations. The men marry early, soon after circumcision, and have only one wife; concubinage is almost unknown. The women, probably on account of the hard work in which they are engaged, seldom bear many children.

In spite of the dark colour of their skin, Dr. Maclay was able to recognise a change of colour in the face among the Papuans. He does not, however, state whether blushing follows upon a sense of shame, but only notices that the features are darker when they are overjoyed, or have been making great efforts, *e.g.* in the dance.

The Papuan women, like their European sisters, cultivate the art of which Mr. Turveydrop was the distinguished professor. Readers of the "Arabian Nights may remember how that the seductive wriggling of the sides of one of the damsels "shaped like the letter alif," caused the "world to turn black" before the eye of a susceptible hero, and will therefore fully appreciate the subtle influence of a peculiar and "killing" wriggle which the Papuan maid begins to have at even the tender age of seven years. The half-caste women whom one sees at Batavia seem to have adopted a similar though modified habit.

The favourite position of the Papuan men—as it seems to be among the Malays also—is resting the buttock upon the heels (*das Hocken*), while the whole surface of the soles of the feet is applied to the ground. Dr. Maclay found that he could keep his balance only when the toes alone were in contact with the earth. This position of the Papuan must not only be acquired, but must depend also upon a peculiar relation of proportion in the limbs. Nothing can be said with certainty as to the duration of life among the Papuans. Dr. Maclay never saw an old individual among them.

Dr. Maclay, from the observations which he has at present made, concludes that *the Papuan stock falls into numerous varieties, distinct from one another, which, however, have no sharp lines of demarcation.*

On December 19, 1872, some natives came to Dr. Maclay to inquire the cause of some smoke which had been seen rising from the sea between Vitias and Dampier Islands. This turned out to be the clipper *Izoumroud*, which had been sent out to look for the traveller (whose death, it seems, had been announced in the English journals), at the instance of the Grand Duke Constantine.

Early on the morning of the 24th the *Izoumroud* weighed anchor, and as she steamed away there could

* A small marsupial found in Papua. It is figured in Wallace's "Malay Archipelago."

† The long hair worn at the back of the head is termed "gatessi."

scible fluids was followed by their rapid development, and they appeared in specimens of pure rain water.

Although these observations may not appear to encourage the hope of success in discovering the presence of atmospheric particles connected with the origin of disease, it must not be forgotten that they only refer to bodies distinguishable from one another *whilst in the air*, the possibility remaining that many of the finer molecules present in it are really of different natures, and may yet be distinguished from one another by means of their actions or developments. Many interesting questions are suggested in connection with the fact of the presence of such considerable numbers of living cells in the air. What becomes of them when drawn into the respiratory cavities of animals? Is their vitality destroyed, and, if so, how are they got rid of? Are they ever capable of undergoing any development within the organism, and do they then exert any prejudicial influence on the recipient? These and similar questions can only be answered by means of patient and extended experiment, but even such imperfect and superficial observations as the present will, I trust, serve a useful purpose in clearing away a few of the preliminary obstacles from the path of investigation.

towards the insect until the glands reach it and suck its juices. In the *Naturalist* for January is an account of Roth's observations on the irritability of the sundew, made nearly a century ago.

WE have before us the first number of what seems to us likely to be a most useful work—"Insects of the Garden; their habits," &c., by Dr. A. S. Packard. The present number contains 32 pp. with woodcuts and a coloured plate, and is published at 25 cents. It forms part of a work called "Half hours with Insects," to be completed in 12 parts.

AN advance sheet of the forthcoming number of Petermann's *Mittheilungen* contains an official account of the voyage of Count Wiltschek in the summer of 1872 to Spitzbergen and Novaya Zemlya in the yacht *Isbjörn*, the chief object of which was to plant a provision depôt in the Arctic Sea for the Austro-Hungarian expedition under Weyprecht and Payer in the *Tegethoff*. The account contains some valuable observations on the ocean-currents, temperature, weather, wind, &c., of the region, and the geology of Novaya Zemlya; collections of the fauna and flora of that island were made, and photographic views were taken. Nothing is known at present of the Austro-Hungarian expedition

This instrument depended for its function on the wind. If there was no wind, there was no current through the tube, and nothing was caught on the glycerine; but in general there was wind enough, and the captures were ample, often embarrassing by their multitude. The observations were mostly made in the neighbourhood of London, at the Greenwich Observatory. The nature of the captures varied according to the direction and velocity of the wind, the state of the weather, and the season of the year. A north-west wind, blowing over London, brought soot and globules of coal-tar, textile fibres, nondescript *débris*, a few vegetable spores, now and then an epithelial scale or two, always a number of half-cooked starch-grains (identified by their reaction with iodine and by traces of concentric lamination giving a black cross with the polariscope), and sometimes microscopic bread-crumbs (half-cooked starch-grains in meshes of gluten). The starch-grains were the most constant capture of all, in all seasons and for all directions of wind. They seem to be very durable. (If I remember rightly, M. Pouchet found starch-grains in all specimens of dust, even the most ancient, obtained from the neighbourhood of human dwellings.) A southerly wind, blowing from the country, brought a great variety of vegetable spores and pollen-grains and *débris*, with a smaller proportion of matters characteristic of town air. The size and quantity of the captures depended mainly on the velocity of the wind. Once or twice a strong wind swept a living acarus, or an entomostracan, or the shell of a diatom into the glycerine. In dry windy weather a quantity of siliceous sand was caught, which gave trouble by tilting the disk when in preparation for the microscope, and the larger grains had to be removed with the point of a needle.

The most interesting variation in the character of the organic captures was that which depended on the season of the year. In January and February scarcely anything was found (besides *débris* and inorganic matter) but a few fragments of mycelium of some fungus; but with the first fine weather in March the glycerine began to yield good returns. Spherical grains of poplar pollen were caught in large numbers, thirty or forty in a single drop, though the nearest poplar tree was a quarter of a mile distant. These were soon followed by the triangular pollen of birch and hazel—trees depending, like poplar, on the agency of the wind for fertilisation. From this time onward, through spring and summer, a great number and variety of pollen grains were caught. Cryptogamic cells increased in number through the summer, and reached their maximum in the autumn, when brown septate spores and others of various kinds, which my imperfect knowledge did not enable me to identify, appeared in abundance. If left for some days, they began to germinate. Towards winter their number diminished, the latest being minute dark brown oval spores of some species of agaricus (?). The winter months were comparatively barren.

I did not find any Bacteria, but there were numbers of excessively minute particles, of which I could not tell the nature. Once, after leaving the aeroscope for several days, I found the glycerine swarming with a minute *torula* which had evidently multiplied in that pabulum. In fact the glycerine was fermenting.

Among these facts, the only one which seems to have any bearing on the question of the propagation of infectious diseases is the great prevalence of cryptogamic spores in the air in autumn, when those diseases are especially rife.

To avoid fallacy in the results obtained, I used to place two drops of glycerine on the same slide, but only directed the air-current against one of them; both were examined under the microscope, and the difference credited to the air. By using glycerine that had been boiled with carmine, many of the

Nature, April 9, 1874 – Hubert Airy.

of his travels.

Transactions of the Albany Institute, vol. vii. (Albany, U.S., 1872.)

THIS institution is one of the oldest of its kind in America, having been originally founded upwards of eighty years ago, just after the conclusion of the American War of Independence. At present it is one of the most comprehensive and active of the American societies, its sphere of work embracing all departments of literature and science. In an eloquent annual address, which is the first paper in this volume, Orlando Meads, one of the oldest members of the Institute, sketches its history, and gives reminiscences of some of the most eminent men who have been connected with the Society, including several who have left their mark on the country. A characteristic feature of this volume is the reports of what has been done during the year, both in America and Europe, in the various divisions of science and literature, the institution being divided into three departments—Physical Sciences and the Arts, Natural History, and History and General Literature, and these again into a number of classes. Thus we have in the present volume, reports on botany, zoology, chemistry, and general literature. Of the papers in this volume we may notice one On Nitro-glycerine, as used in the construction of the Hoosac Tunnel, by Prof. G. M. Mowbray. The author traces the history of the dangerous article, gives an account of his own investigations regarding it, and describes the method in which it was used in boring the Hoosac tunnel.—On certain new Phenomena in Chemistry, by Verplanck Colvin, describes some very remarkable experiments in amalgamation made by the author. From Newton to Kirchoff, by Dr. L. C. Cooley, traces in an interesting way the progress of research on Light during the period indicated; and in Researches in the Theory and Calculus of Operations, by J. A. Paterson, we have a most elaborate and intricate investigation on the theory of the actions of various forces of Nature. Mr. C. H. Peck contributes a Synopsis of New York Uncinulæ.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

Microscopic Examination of Air

IN support of the conclusions arrived at by Mr. Douglas Cunningham, of Calcutta, in his "Microscopic Examinations of Air" (NATURE, vol. ix. p. 330), and in illustration of the method which he employed, perhaps I may be allowed to describe some observations of the same kind which I made three years ago but have not had leisure to continue or prepare for publication.

A sentence in Dr. Parkes' "Manual of Hygiene," alluding to the importance of minute examination of the air, turned my thoughts in that direction. The instrument which I constructed for the purpose was contrived after the manner of a weathercock, presenting the wide mouth of a funnel to the wind, while the

* There is good reason to believe that other things besides pollen produce "summer catarrh."

C. H. Blackley, M. R. C. S., in a work on "Experim. Researches in Catarrhus Æstivus (Hay Fever or Hay asthma), ascribing most cases of that affection to pollen in the air, – records his observations on the latter subject. *

Comparing different places, he used glass slides smeared with an adhesive substance, counting under a microscope the number of pollen grains caught on a square centimetre in 24 hours, – between April & August. The number varies considerably – rain diminishes them – wind increases them. Average in country 10 times that of city. By kites a trial was made of air high up: more than 19 times as much pollen between 300 & 1500 feet as near the ground.

~~Douglas Cunningham, of Calcutta published in 1873 a book on the Microscopic Examination of air.~~

See slip, further on

Carbonic Acid Gas.

	Parts in 10,000
London School Room	29
Hospital, Madrid	43
Bedroom, "	48
Munich Beer Saloon	49
Paris Lecture Room	67
Munich School Room	72

10 parts in 10000 (1 in 1000) highest allowable

4 per ct. dangerous to life –

10 " soon fatal –

Gahan Unit Cal.
Feet = 1000

Lower School Room	24
Hospital, Mental	43
Kitchen "	18
Mental Employees	48
Boys' Industrial Room	24
Women Cottage Room	12

10 Feet = 1000 (Unit Cal.)

Total = 169

Sources of Air Foulness.

Respiration — Animal Exhalation

Combustion — Putrefaction

Stove-Gas — Burning Gas

(Chokedamp — Fire Damp)

Arsenical Wall Papers —

Drainage — Sewerage —

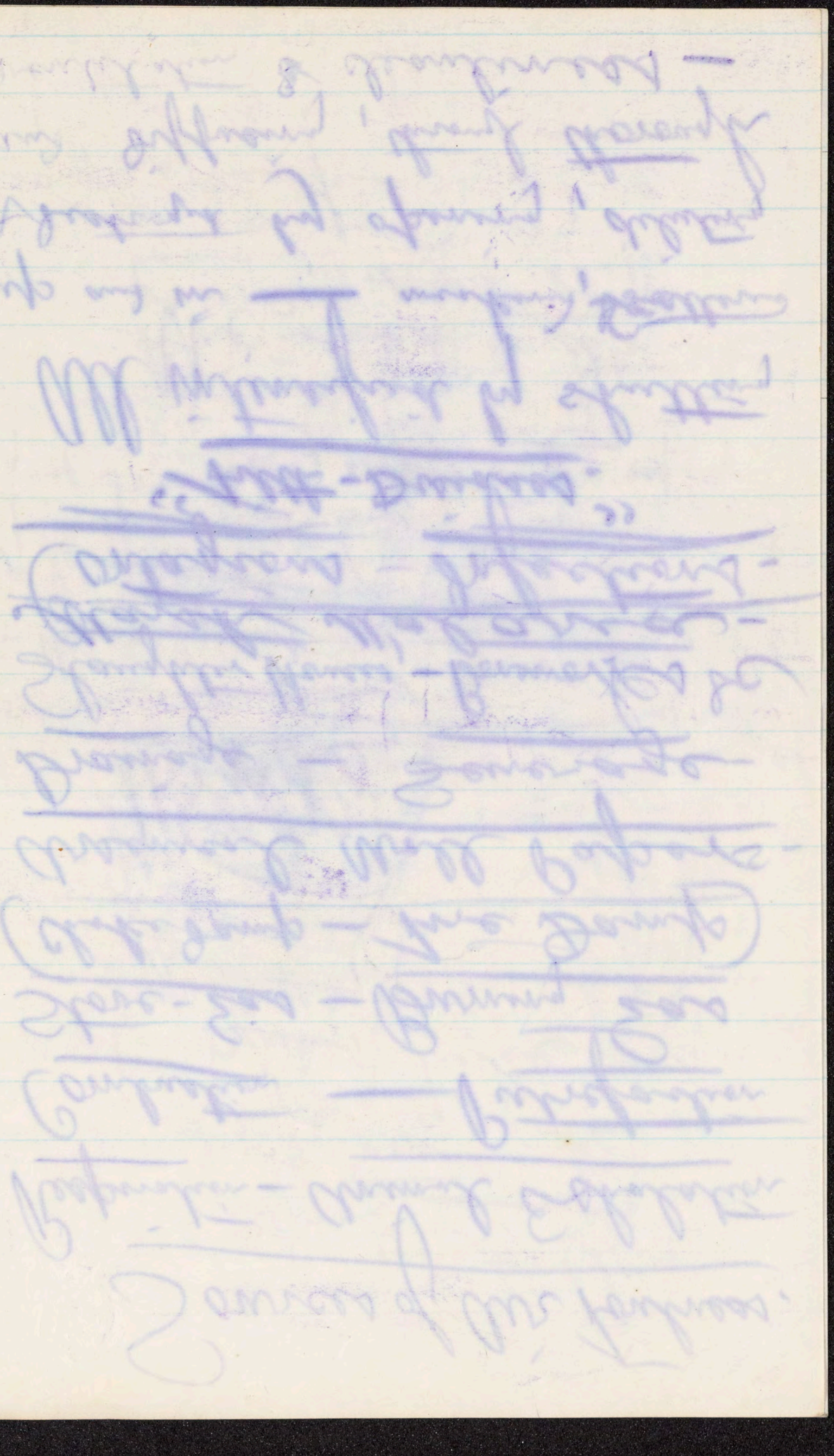
Slaughter Houses, — Boneworks &c

Marsh Malaria —

Contagions — Infections —

"Filth-Diseases."

All intensified by shuttering up and in — weakened, scattered destroyed by opening, diluting and diffusing, thro'l thorough ventilation & cleanliness —



~~[Show draught in bent glass tube containing candle~~

~~place or stone~~ every fire chimney shows action of unequal temperatures.

Winds:— origin — all in the one past cause, inequality of temperature (aided by movements of the earth) under Sun's influence.

We should imitate nature in our homes & other buildings.

First:— for diffusion, high ceilings.

Diffusion — rooms — concentration intensities.

Second — Use all spontan-
-eous air-movements under
differences of heat & cold.

Open fire ventilates much.

Open stove somewhat.

Open windows wide in summer —
a little top & bottom in winter —
Several better than one much —
Wood under sash.

Perforated zinc pane — or brick —

Maine's tube

[show one]

Gas-Burner — & Chandelier — & Ventilation

9

S. R. Barker's

Warming & Ventilating

flue & registers —

[Show model]

Inlets and outlets —

[Show photographs.]

Dwell on the diagrams of

inlets and outlets. —

Fan ventilation —

Dr. Kinkbride insists on it in Hospitals.

Amounts called for [See Table]

Disinfection — a last resort —

Cheap, common & good:
lime, charcoal, tar.
(all leave some deposit)
Best for sewage:
Sulph. iron, 10 lbs in bucket of water for good sized well —
chloride of lime — less will do, but dissolves (acts on metal pipes)
Soap-water & abundant flushing for closet pipes & traps —
& ventilation as preventive

Sir to Lecture on Drainage & Disease —

Ventilation.

Air used in 24 hrs, by one person 350 cub. feet.

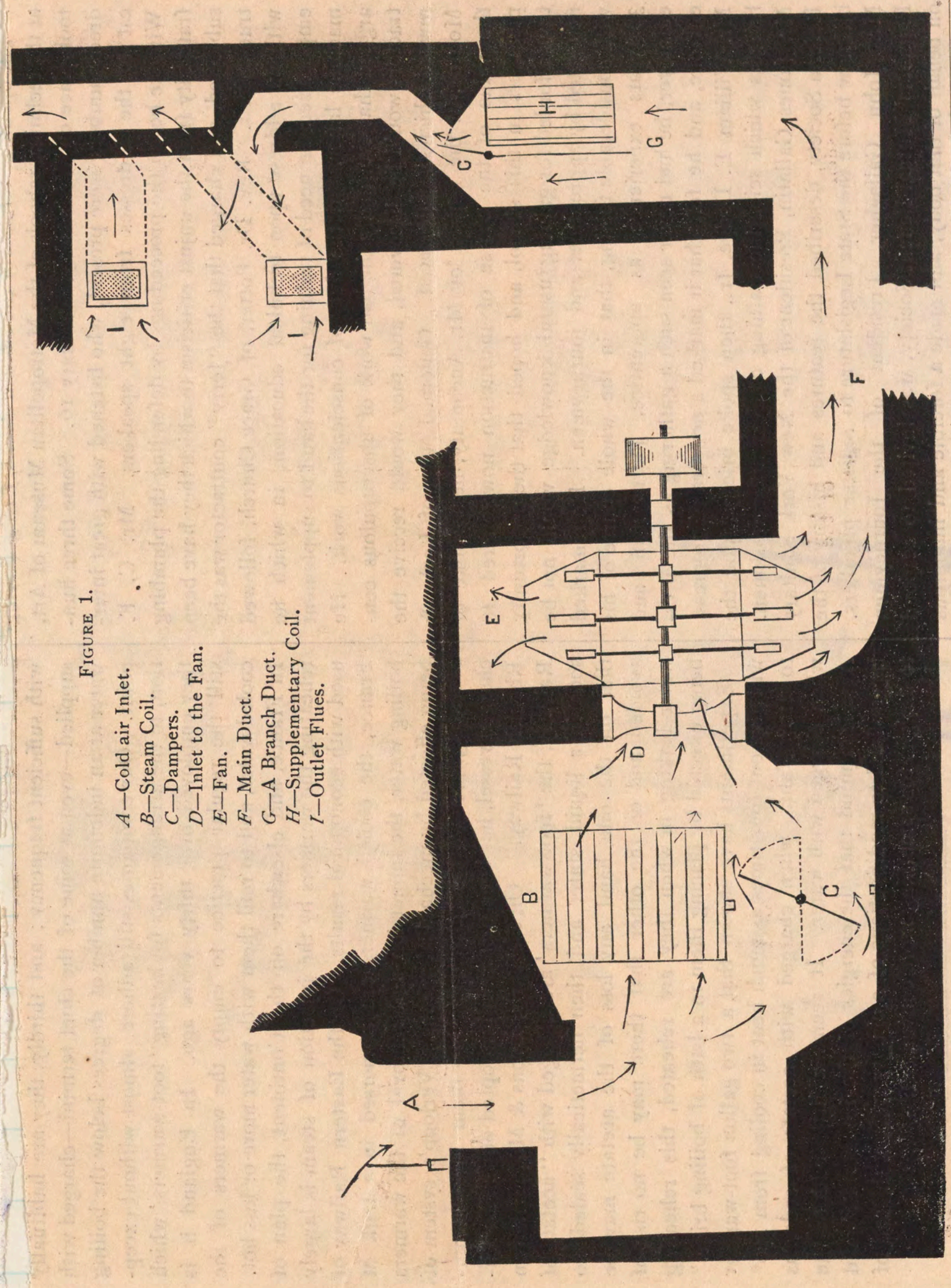


FIGURE 1.

A—Cold air Inlet.
B—Steam Coil.
C—Dampers.
D—Inlet to the Fan.
E—Fan.
F—Main Duct.
G—A Branch Duct.
H—Supplementary Coil.
I—Outlet Flues.

The opening exercises of the class in Sanitary Engineering at the technical schools of the Metropolitan Museum of Art, took place on Wednesday, February 16. Some three hundred plumbers were present, who listened with great interest to the addresses from eight speakers. Mr. C. F. Wingate began the proceedings by defending the plumbing fraternity from the unjust criticism to which they have been subjected, and charged that the "Jerry" contractor was the true culprit. Rev. Dr. Potter, of Grace Church, followed with an address upon technical education, in which he emphasized the need of training for the hand to supplement machine labor, and the duty of conscientious work. He argued that eventually the bad work of unscrupulous contractors would be discovered, and they would receive the reward which they deserved. General Locke, of Locke & Monroe, at the request of Mr. Auchmuty, next spoke of the value of the course of instruction now offered to plumbers in this school, and hoped that the opportunity thus afforded for gaining useful knowledge would not be neglected by apprentices and journeymen. He remarked with considerable feeling, that in the whole course of his 38 years experience as apprentice, journeyman and employer, he had never seen such a gathering as the present one, and he felt that it marked a new era of progress. Mr. William E. Dodge, Jr., then spoke briefly upon the benefits which scientific training confers upon workmen. Mr. James Gallatin, President of the New York Sanitary Reform Society, described the features and history of the bill now before the State Legislature to register plumbers. Mr. John Gallagher, President of the Journeymen Plumbers' Mutual Benefit Society, was invited to respond on behalf of that body, and made a forcible and humorous [illegible] appreciated by the audi[illegible]

[illegible] with sufficient frequency; and thirdly, they are habitually supplied—even at some of the chief termini—charged with water at an indefinite number of degrees below the boiling point. Our companies still adhere, almost without exception, to the arrangements for heating 'foot-warmers' which they employed over thirty years ago. In England it is still the regular practice to empty the warmers of the cooled water, and to refil them with water more or less hot. In France, and elsewhere on the Continent, the plan of reheating the warmers by the injection of steam is largely used with economical results. On the Eastern Railway of France, the cooled warmers are immersed in a tank of boiling water, the immersion and removal of the warmers being effected by mechanical means. Verloop's system of reheating the warmers by enclosing them in a steam-charged vessel, has been successfully adopted on the Dutch-Rhenish Railway." On the Paris, Lyons & Mediterranean Railway, the 'foot-warmers' are charged with "acetate of soda in a liquid state, and then hermetically sealed, so that on the one hand any loss of the acetate may be avoided, and on the other that there may be no risk of water leaking in when they are reheated, this reheating being effected by placing them in a bath of boiling brine."

Experiments have shown that a two-gallon foot-warmer will give out four times as much heat in cooling from 190° to 110° Fahr., when charged with acetate of soda, as when charged with water. It seems a little odd to the American mind that the energies of the inventors should be confined to modifications of a clumsy system, instead of to designs for something more convenient.

Ventilation.

Air used by one person in 24 hrs, 350 cub. feet.

Least allowable room-space 700 c. ft.

Best, for each person, 1500 c. ft.

Desirable hourly-air-supply for each person:

School-rooms	1500	cub. ft.
Public Assembly-rooms	2000	" "
Workshops [Dr. Windship]	2500	"
Medical Hospitals	2500	"
Surgical "	3000	"
Hosp. for Epidemics	5000	"

Ventilation

For infected rooms & buildings —

Sulphurous acid gas — burning sulphur (1½ lb to each 1000 cub. ft) shutting all up for hours — &

High heat —

200° to 300° destroys fabrics, & will disorganize all contagia.

Cold returns but does not destroy infection — (Proved with Mellon Fever)

(Carbolic acid inferior to the above disinfectants)

But, above all, aim at non-infection, in-stead of disinfection.

The most ~~terrible~~ diseases which scourge humanity are pre-ventable.

Plague —
Cholera —
Yellow Fever —
Diphtheria —

If every house, street, wharf & ship were kept as clean as it is possible to keep them, with air and water, — with drainage & sewerage as good as they might be made, the mortality of our cities would be

reduced ~~[illegible]~~ $\frac{1}{3}$ or $\frac{1}{2}$, if our habits of personal hygiene were equally improved, and, the age of men and women would be lengthened on the average from not much over 40 years as now, to 50 years or more. It would not be a rare thing as it now is, for Chevreuls, Montefiores, Horace Bunyan, Peter Coopers and Emmil Pattersons to live to 90 or ~~the six Moses Montefiores, to~~ 100 years. That you may all be so wise and happy as to aid in realizing and experiencing so good a time to come, is my parting wish, with which I close these lectures upon Health.